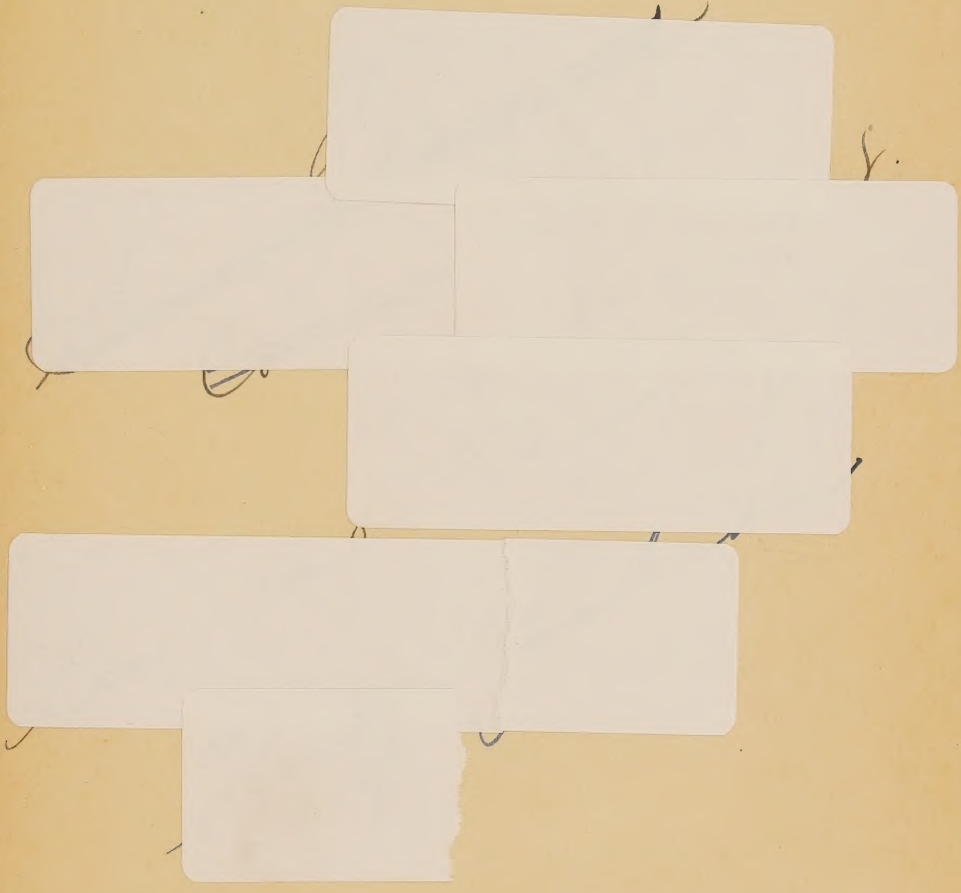

EXERCISES IN STATISTICAL METHODS

BY

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AND

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PREFACE

In defense of the multiplicity of textbooks now on the market it is often suggested that the ideal condition would be for each teacher to write his own text. Certainly it would be most desirable for each teacher of statistics to develop his own peculiar series of laboratory exercises, best adapted to his own methods of teaching and to his own groups of students. Such a group of problems, however, is not forthcoming as the result of a few hours' work and many teachers giving instruction in statistics, as one of several subjects, find it difficult to do the necessary probing incidental to the selection of exercises that will effectively illustrate elementary statistical methods. This collection of problems, while designed primarily to be used with Chaddock, *Principles and Methods of Statistics*, will be found equally effective, it is believed, when used in conjunction with other elementary texts on statistical methods. The data used as the bases for these exercises have been drawn from many sources, published and unpublished. To the various persons and organizations responsible we express our appreciation.

R. E. C.
F. E. C.

New York
June, 1928

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EXERCISES IN STATISTICAL METHODS

EXERCISES IN STATISTICAL METHODS

I

INTRODUCTION

Laboratory equipment and procedure. It is no longer necessary to defend laboratory work as an essential part of a course in statistical methods. The question is rather one of a proper balance between the time devoted to class and to laboratory. It is our feeling that the best proportion is two hours weekly of laboratory to one of class, certainly not less than two hours of laboratory to two of class. The most satisfactory results seem to be obtained when the laboratory period consists of two continuous hours.

The following suggestions are made with reference to equipment:

Tables. These may be inexpensive "kitchen tables" with soft wood tops or more expensive highly finished oak. The important considerations are that the tops be smooth and that each student have ample room. Occasional refinishing of the tops will prolong the usefulness of the tables.

Adding and calculating machines. While not absolutely essential these mechanical aids are extremely useful, especially when computing percentages, fitting the normal curve, correlating, and analyzing time series. In addition to calculating machines, and especially in their absence, calculating tables, mentioned below, are highly desirable.

Ruling pens. Tables and charts executed with ruling pens present a more finished appearance than when ordinary types of pens are used. It is not necessary for the student to buy an expensive instrument. Of course, tentative sketches of charts and tables should be made in pencil.

Drawing ink. Black (India) ink for general use. Colored drawing inks for use in graphics (red, green, violet, orange, blue).

Rulers. Fifteen or eighteen inch rulers with two metal edges will be found desirable.

Pencils and erasers. Best results will be obtained if a medium hard (3H) drawing pencil be used in preliminary sketching of graphs and tables.

Graph paper. Coördinate and semi-logarithmic paper should be kept on hand or purchased in advance by the student. Among the well-known firms who furnish graphic supplies are:

Codex Book Company, 461 8th Avenue, New York City
Educational Exhibition Company, Providence, Rhode Island
Eugene Dietzgen Company, 218 E. 23rd Street, New York City
Keuffel and Esser Company, 127 Fulton Street, New York City

Books. A bibliography is given below (p. 6). In it will be found a list of textbooks, periodicals, sources, and calculating tables. The equipment of the laboratory should include at least the more important sources of statistical data. Certain of the governmental statistical publications may be obtained without charge.

Many teachers find it desirable to require that exercises be written up in a standardized form, enclosed in a manila folder, and handed in within a specified time after assignment. This promotes neatness and promptness in the execution of the exercises.

Suggested topics for class discussion in an elementary course. The following topics are suggested for the guidance of instructors and not for the purpose of setting up a rigid outline of content or order of treatment. Sixty divisions are indicated in order that the subject matter may be easily adapted to courses covering an entire year, one semester, or one quarter.

1. Introduction. Nature, uses and applications of statistical methods.
2. Misuses of statistical data. Fallacies and erroneous conclusions.
3. The scientific method. Statistics in the service of the social sciences. The experimental method and its limitations in the social sciences.
4. The collection of primary data, a brief description. The use and evaluation of important statistical sources.
5. Presentation of statistical data in tabular form.
6. Presentation of statistical data in graphic form. Curves.
7. Other forms of graphic presentation.
8. Classification. Attributes and variables. Types of statistical series (historical, geographical and frequency).
9. Frequency distributions. Formation. Types. Continuous and discrete data.
10. Non-cumulative and cumulative distributions. Graphic representation.
11. The concept and uses of an average. Kinds of averages. The arithmetic mean, simple and weighted.
12. Computation of the arithmetic mean from ungrouped and grouped data. Testing the assumptions involved in determining the mean from grouped data.

13. The short method of computing the arithmetic mean from grouped data.
14. Characteristics of rates, ratios, and percentages. Averaging rates, ratios, or percentages.
15. The median. Determination from ungrouped and grouped data. Graphic determination.
16. Quartiles and deciles. Determination arithmetically and graphically.
17. The mode. Methods of determination. The relative positions of mean, median, and mode in symmetrical and asymmetrical distributions.
18. The geometric mean. Computation and uses. Summary of the characteristics of the arithmetic mean, median, mode, and geometric mean. Criteria as to use.
19. Significance of dispersion. Measures of absolute dispersion.
20. Measures of absolute dispersion. Computation and interpretation of the standard deviation.
21. Absolute and relative dispersion.
22. Skewness and its measurement. Review of measures descriptive of the frequency distribution.
23. Index numbers. An illustration of methods of collection, classification, and combination of statistical data.
24. Steps and problems in the construction of index numbers of prices.
25. Combining price data. Averaging relatives. Combining aggregates.
26. Problem of selecting a base. Weighting.
27. Use of the geometric mean. Discussion of specific index numbers in current use.
28. The problem of sampling in collecting data. Representativeness of the sample.
29. Adequacy of the sample. Kinds of errors.
30. The normal law of error. Probability and the symmetrical, bell-shaped curve.
31. Procedure in fitting the normal probability curve.
32. Practical uses of the bell-shaped curve. Use of the area under this curve for describing the probability of errors of measures from samples.
33. Unreliability of measures obtained from random samples. Significance of difference between measures obtained from two samples.
34. Applications of probability (for example, life table construction).
35. Nature of the inquiry into cause and effect relations.

36. Comparison of series. Covariation and correlation. The problem of measuring degree of relationship.
37. The scatter diagram. The correlation table.
38. The linear hypothesis. Lines of regression. The meaning of the correlation coefficient. Direct and inverse correlation.
39. The correlation coefficient for grouped data.
40. The correlation coefficient for ungrouped data.
41. The uses of the coefficient of correlation. Unreliability of r. The regression equations. Limits of error in estimation from regression equations.
42. Rank method of correlation. Non-linear correlation. Significance of difference between η and r, when computed from the same data.
43. Interpretation of coefficient of correlation. Illustrations. Correlation and causation.
44. Analysis of time series. Movements in time series. Importance of the ratio chart in describing time series.
45. Secular trend. Determination by free-hand drawing, mechanical devices, semi-averages, and moving averages.
46. Determination and measurement of trend by fitting straight line.
47. Elimination of trend.
48. Seasonal variation. Methods of measurement.
49. Methods of eliminating seasonal movements.
50. Other adjustments applicable to time series. Consideration of residual factors.
51. The measurement of cyclical fluctuations. Methods of expressing cyclical fluctuations. Use of comparable units.
52. Correlation of time series.
53. Meaning and determination of "lag" or "lead." Caution in forecasting.
54. The problem of deflation in a price series. Use of index numbers.

55–59. A more elaborate treatment of the problems involved in the collection and presentation of original data and in the use of data collected by others.

60. General review.

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II

MISUSES OF STATISTICAL DATA

1. "Julius Kruttschnitt of the Southern Pacific has given ..... some statistics to prove that high railway charges have nothing to do with agricultural distress. The farmer, he tries to prove, would get only an 8 per cent increase in the value of his products if the railways returned to him every cent they collect for hauling his goods. That 'is a fact which can be proved by government statistics.' The transportation revenue from agricultural products in 1922 was $715,973,000; the total value of farm crops was $8,961,000,000. Mr. Kruttschnitt thinks that with these figures given, simple arithmetic will do the rest." — From a *New Republic* editorial comment.

Do you agree with Mr. Kruttschnitt?

2. "Seven per cent of the automobile drivers in Paris are women. However, in the matter of infringements of the traffic law only three per cent of the violations are caused by women drivers. This shows that women drive with greater caution or more skill than men." — *Le Figaro.*

Does this seem to be a fair statement?

3. Miss Katherine Mayo, in *Mother India* (page 22), says, "The Indian girl, in common practice, looks for motherhood . . . anywhere between the ages of fourteen and eight. The latter age is extreme, although in some sections not exceptional; the former is well above the average."

A critic of the book, Dhan Gopal Mukerji, in *A Son of Mother India Answers* (page 21), offers the following evidence furnished by a physician: "Miss Balfour records the cases of 304 Indian mothers who were delivered of their first babies in Bombay hospitals, and the average age was 18.7 years. Only three were aged fourteen, and they were the youngest. Reports for the years 1922 to 1924 of the Madras Maternity Hospital, where 2312 mothers were delivered of their first babies, show that the average age was 19.4. There were seven mothers aged thirteen and twenty-two aged fourteen. Miss Balfour also has reports of 2964 cases in

other parts of India, including the North, of which only ten cases were below fifteen years, and thirteen was the youngest age."

Do you accept either of these statements?

4. "The real prohibition states have larger death rates than those that are not obeying the law. Take the death rate per 1000 population: City of Birmingham, 17.4; Atlanta, 18.0; Nashville, 19.3; Memphis, 21.7. These four cities are dry. On the other hand, take Milwaukee, 13.0; New York, 14.5; Pittsburgh, 15.9; Cincinnati, 16.6. These four cities last mentioned are dry in imagination. Let us look back to the time when license states had license laws, when the 1910 census was taken. We will take dry Kansas and wet New York. To every 100,000 population, Kansas had 286 divorces and New York 60. Kansas church membership was 28.4 per cent; New York, 43.7 per cent. Murders show Kansas had 11.35 per 100,000, New York 6.24. Kansas had 1148 savings bank depositors for each 100,000 population, while New York had 32,065." — From a letter to the *New York World.*

Assuming the above figures to be correctly stated, what fallacies are present in the argument?

5. The average deposit per individual depositor in savings banks in the United States was $437.89 in 1913. By 1926 this figure had risen to $633.10 per depositor, indicating that savings bank depositors were noticeably more thrifty than at the earlier date. — Data from *Statistical Abstract of the United States, 1926.*

Is the conclusion a sound one?

6. Gas and electric utilities in New York State are paying taxes amounting to $34,000,000 a year — a dime in each dollar they receive from sales of service. This electric company alone paid in taxes last year more than $800,000.

Nobody especially likes to pay taxes. But taxes there must be, or government could not carry on its work.

Some people think they want the government to own and operate public utilities. In that case the taxes now paid by utilities would be wiped off the rolls; and individuals and other businesses would have to make up the $34,000,000 deficiency — just a thought for the local taxpayer. — Adapted from an advertisement of an electric power company.

Is this a correct statement in regard to the deficit?

7. Only 20,000,000 of the 105,000,000 people in the United States could be classified as intellectual. Of the remaining 85,000,000 persons, 45,000,000 have reached the mental age of 14 years, 15,000,000 have reached a mental age of not more than 8 years, and 25,000,000 can at best be classified only as mediocre. — Adapted from a *New York Herald* editorial comment upon a public address.

   What do you think of this statement?

8. "A decrease of about 500 per cent, or a drop from 3160 to 641 students, in the enrollment of veterinary colleges in the United States has taken place in the past five years [1916–1921]." — *The Ohio State Lantern.*

   Is this a correct use of the percentage?

9. A Portland, Oregon, paper announced that during January, the first month under the new prohibition laws, drunkenness decreased nearly 800 per cent from the preceding December. If there were 100 cases of drunkenness in December, how many were there in January?

III

THE FREQUENCY DISTRIBUTION AND ITS DESCRIPTION AVERAGES, DISPERSION, AND SKEWNESS

10. Construction of frequency distribution from ungrouped data. Width and number of intervals. Class limits. (Data of Table 1.)

(a) Tabulate the number of meals at each price.

(b) Show graphically the results of (a).

(c) From an examination of (b), which shows the concentration at certain prices, determine the proper class limits for a frequency distribution.

(d) Construct the frequency distribution, using class intervals as determined from (c).

(e) Show graphically the results of (d).

(f) Select any one class below and any one class above the class of greatest frequency, and ascertain to what extent the mean of the ungrouped values in each of those classes differs from the mid-value assumption.

11. Construction of frequency distribution from ungrouped data. Width and number of intervals. Class limits. (Data of Table 2.)

(a)–(f) Procedure identical with that of Exercise **10.**

12. Construction of frequency distribution from ungrouped data. (Data of Table 3.)

(a) For a department, assigned by the instructor, construct a frequency distribution, with uniform class intervals of $2.50 and with mid-values at $1.25, $3.75, $6.25, etc.

(b) Show graphically the results of (a).

(c) Select any one class below and any one class above the class of greatest frequency, and ascertain to what extent the mean of the ungrouped values in each of those classes differs from the mid-value assumption.

13. Frequency series forming moderately skewed curve. (Data of Table 4.)

Show graphically the distribution of workers in bituminous coal mines according to the number of days worked in 1921.

14. Frequency series forming moderately skewed curve. (Data of Table 5.)

Show graphically the distribution of laborers in blast furnaces, according to earnings, during a 16-day pay period in 1926.

15. Frequency series forming moderately skewed curve. Class intervals of varying width. (Data of Table 6.)

Show graphically the distribution of brakemen in West Virginia bituminous coal mines, according to earnings per half month, 1924.

16. Frequency series forming "J" curve. (Data of Table 7.)

Show graphically the distribution of male deaths from heart disease, by age periods, for New York City.

17. Frequency series forming reverse "J" curve. Class intervals of varying width. (Data of Table 8.)

Show graphically the distribution of individual income tax returns, according to income classes, 1925.

18. Graphic comparison of two reverse "J" curves. (Data of Table 9.)

(a) Show graphically, on the same axes, the distributions of the number of persons in each age group for the United States, 1880 and 1920.

(b) Show as in (a), the per cent of persons in each age group.

(c) Compare and interpret (a) and (b).

19. Graphic comparison of two reverse "J" curves. (Data of Table 9.)

(a) Show graphically, on the same axes, the distribution of the number of persons in each age group for the United States, 1920, and of the number of foreign-born white persons in each group, 1920.

(b) Show as in (a), the per cent of persons in each age group.

(c) State which method of presentation is more effective for comparison and give your reasons.

20. **Frequency series forming "U" curve.** (Data of Table 10.)

Show graphically the distribution of deaths from all causes, by age periods, for New York City.

21. **Graphic representation of cumulative frequency series (ogive).** (Data of Table 4.)

(a) Cumulate the frequencies on a "less than" and on an "or more" basis.

(b) Show graphically, on the same axes, the two cumulative series of (a).

22. **Graphic representation of cumulative frequency series (ogive).** (Data of Table 5.)

(a) Cumulate the frequencies on a "less than" and on an "or more" basis.

(b) Show graphically, on the same axes, the two cumulative series of (a).

23. **Arithmetic mean. Problem of weighting.** (Data of Table 11.)

(a) Compute the "unweighted" mean price received by the producer for eggs in 1926.

(b) Compute a weighted mean price of eggs for 1926.

(c) Account for the difference between the results of (a) and (b).

24. **Weighted arithmetic mean. A problem of averaging rates.** (Data of Table 12.)

(a) Compute the unweighted mean death rate from tuberculosis (all forms), for all cities of 25,000 to 50,000 population, New York State, 1926.

(b) Compute a weighted mean for the same data. This "combined general death rate" may be obtained in two ways.

(c) Account for the difference between the results of (a) and (b).

25. **Arithmetic mean. Calculation by long and short method.** (Data of Table 13.)

(a) Compute by the long method the mean salary of visitors and visitors-in-training in family welfare organizations.

(b) Compute the mean by the short method.

(c) Demonstrate that the results by these two methods should be identical.

26. Arithmetic mean. Calculation by long and short methods. (Data of Table 14.)

(a) Compute by the long method the mean weekly earnings of women working as hand sewers on coats, St. Louis, 1926.

(b) Compute the mean by a short method.

(c) Demonstrate that the results by these two methods should be identical.

27. Arithmetic mean. Calculation by long and short methods, when class intervals of the distribution vary in width. (Data of Table 6.)

(a) Compute by the long method the mean earnings per half month of brakemen in West Virginia bituminous coal mines, 1924.

(b) Compute the mean by a short method.

28. Arithmetic mean. Calculation by long and short methods, when class intervals of the distribution vary in width. (Data of Table 6.)

(a) Compute by the long method the mean earnings per half month of laborers in West Virginia bituminous coal mines, 1924.

(b) Compute the mean by a short method.

29. Arithmetic mean. Comparison of means when computed from ungrouped and from grouped data. (Data of Tables 3 and 15.)

(a) For a department assigned by the instructor compute the mean earnings from the ungrouped data of Table 3.

(b) Compute for the same department the mean earnings from the grouped data given in Table 15.

(c) Account for the difference between the results of (a) and (b).

30. Arithmetic mean, median, and mode. Comparison of their magnitudes in a positively skewed distribution, and their graphic representation. (Data of Table 15.)

(a) Determine the mean earnings for the entire plant.

(b) Determine the median earnings.

(c) Determine the modal earnings by the Pearsonian empirical method and by one other method.

(d) Show graphically the distribution of earnings, and indicate on the horizontal scale the positions of the mean, median, and mode.

31. Arithmetic mean, median, and mode. Comparison of their magnitudes in a negatively skewed distribution, and their graphic representation. (Data of Table 14.)

(a) Determine the mean earnings of women working as hand sewers on coats, Cleveland, 1926.

(b) Determine the median earnings.

(c) Determine the modal earnings.

(d) Show graphically the distribution of earnings, and indicate on the horizontal scale the positions of the mean, median, and mode.

32. The determination by graphic methods of median and quartiles. (Data of Table 15.)

(a) Show graphically the cumulative distribution of earnings for the entire plant. The cumulation may be made on a "less than" basis or on an "or more" basis.

(b) Determine graphically the values of the median and the quartiles.

(c) Compare the values obtained in (b) with those obtained for the same data by arithmetic methods.

33. Geometric mean. Mean annual rate of growth in population of the United States, 1910–20.

The population of continental United States, as of April 15, 1910, was 91,972,266; the population, as of January 1, 1920, was 105,710,620. By the use of the geometric principle determine the annual rate of increase of the population of continental United States between these two dates.

34. Geometric mean. Mean annual rate of growth in population of New York State, 1910–20. Application to problem of population estimates at post-censal years.

(a) By the use of the geometric principle determine the annual rate of increase of the population of New York State, 1910–20. (Population April 15, 1910, was 9,113,614; January 1, 1920, was 10,385,227.)

(b) Assuming the same annual rate of increase, 1920–25, estimate the population of New York State, June 1, 1925.

(c) Compare this estimate with the count of the State Census, as of June 1, 1925, which was 11,161,151.

35. Quartile deviation or semi-interquartile range. (Data of Table 13.)

(a) Determine the value of the quartile deviation of the salaries of visitors and visitors-in-training in family welfare organizations.

(b) What proportion of the total frequencies are included within $\pm 1\ Q$ of the median?

(c) In a perfectly symmetrical distribution, what proportion of the total frequencies are included within $\pm 1\ Q$ of the median?

36. Average deviation. (Data of Table 13.)

(a) Determine the value of the average deviation of the salaries of visitors and visitors-in-training in family welfare organizations.

(b) What proportion of the total frequencies are included within $\pm 1\ A.D.$ of the median?

(c) In a perfectly symmetrical distribution, what proportion of the total frequencies are included within $\pm 1\ A.D.$ of the median?

37. Standard deviation. Proportion of cases included within $\pm 1\ \sigma$. Comparison with Q and $A.D.$ (Data of Table 13.)

(a) Determine the value of the standard deviation of the salaries of visitors and of visitors-in-training in family welfare organizations.

(b) What proportion of the total frequencies are included within $\pm 1\ \sigma$ of the mean?

(c) In a perfectly symmetrical distribution, what proportion of the total frequencies are included within $\pm 1\ \sigma$?

(d) Compare the values of Q in Exercise **35**, $A.D.$ in Exercise **36**, and σ above.

(e) In a perfectly symmetrical distribution, what relationships exist between Q, $A.D.$, and σ?

38. Standard deviation. Proportion of cases included within $\pm 1\ \sigma$, $\pm 2\ \sigma$, $\pm 3\ \sigma$. (Data of Table 15.)

(a) Determine the value of the standard deviation of the earnings of the employees of Department 8.

(b) What proportion of the total frequencies are included within $\pm 1\ \sigma$ of the mean;

(c) Within $\pm 2\ \sigma$;

(d) Within $\pm 3\ \sigma$?

(e) Compare the results of (b)–(d) inclusive with the proportions found in a perfectly symmetrical distribution.

39. Standard deviation. Proportion of cases included within $\pm 1\ \sigma$, $\pm 2\ \sigma$, $\pm 3\ \sigma$. (Data of Table 15.)

(a) Determine the value of the standard deviation of the earnings of the employees of Department 7.

(b)–(e) Procedure identical with that of Exercise **38.**

40. Standard deviation. Proportion of cases included within $\pm 1\ \sigma$, $\pm 2\ \sigma$, $\pm 3\ \sigma$. (Data of Table 15.)

(a) Determine the value of the standard deviation of the earnings of all the wage earners of the plant.

(b)–(e) Procedure identical with that of Exercise **38.**

41. Standard deviation. Proportion of cases included within $\pm 1\ \sigma$, $\pm 2\ \sigma$, $\pm 3\ \sigma$. (Data of Table 16.)

(a) Determine the value of the standard deviation of the salaries of "staff" in social work organizations.

(b)–(e) Procedure identical with that of Exercise **38.**

42. Standard deviation, when class intervals of the distribution vary in width. (Data of Table 6.)

(a) Determine the value of the standard deviation of the earnings of brakemen in West Virginia bituminous coal mines, 1924.

(b) What possibilities of error are present in your calculations?

(c) What proportion of the total frequencies are included within $\pm 1\ \sigma$?

43. Standard deviation, when class intervals of the distribution vary in width. (Data of Table 6.)

(a) Determine the value of the standard deviation of the earnings of laborers in West Virginia bituminous coal mines, 1924.

(b) What possibilities of error are present in your calculations?

(c) What proportion of the total frequencies are included within $\pm 1\,\sigma$?

44. Absolute and relative dispersion. Data expressed in like units, means approximately equal in magnitude. (Data of Table 15.)

(a) Show graphically, on the same axes, the distributions of the earnings in Departments 3 and 7.

(b) Determine the value of the standard deviation of the earnings of the employees of Department 3. (Exercise **38.**)

(c) Determine the value of the standard deviation of the earnings of the employees of Department 7. (Exercise **39.**)

(d) Compare the dispersion of the earnings in Department 3 and in Department 7.

45. Absolute and relative dispersion. Data expressed in like units, means approximately equal in magnitude. (Data of Table 17. This table provides a large number of individual exercises.)

(a)–(d) Following the directions for Exercise **44,** the student may select any two noon meals, any one noon meal and the total for noon meals, any two evening meals, or any evening meal and the total for evening meals for the purpose of comparing dispersions.

46. Absolute and relative dispersion. Data expressed in like units, means differing in magnitude. (Data of Tables 13 and 16.)

(a) Show graphically, on the same axes, the distribution of annual salaries of visitors and visitors-in-training, and the monthly salaries of "staff."

(b) Determine the value of the standard deviation of the annual salaries of visitors and visitors-in-training in family welfare organizations. (Exercise **37.**)

(c) Determine the value of the standard deviation of the monthly salaries of "staff" in social work organizations. (Exercise **41.**)

(d) Compare the dispersion of the salaries of visitors and of "staff." (These two series relate to essentially the same type of salaried employees.)

47. Absolute and relative dispersion. Data expressed in like units, means differing in magnitude. (Data of Table 14.)

(a) Show graphically, on the same axes, the distribution of weekly earnings of women working as hand sewers on coats in St. Louis and in Cleveland, 1926.

(b) Determine the value of the standard deviation of the weekly earnings of women working as hand sewers on coats in St. Louis, 1926.

(c) Determine the value of the standard deviation of the weekly earnings of women working as hand sewers on coats in Cleveland, 1926.

(d) Compare the dispersion of the earnings of women working as hand sewers on coats in St. Louis and in Cleveland.

48. Absolute and relative dispersion. Data expressed in like units, means differing in magnitude. (Data of Table 18.)

(a) Show graphically, on the same axes, the distribution of weekly earnings of women in the textile industry and in the men's clothing industry of Mississippi, 1925.

(b) Determine the value of the standard deviation of the weekly earnings of women in the textile industry of Mississippi, 1925.

(c) Determine the value of the standard deviation of the weekly earnings of women in the men's clothing industry of Mississippi, 1925.

(d) Compare the dispersion of women's earnings in textiles and in men's clothing in Mississippi.

49. Absolute and relative dispersion. Data expressed in unlike units. (Data of Tables 19 and 20.)

(a) Show graphically the distributions of yield of milk and percentage fat content of milk.

(b) Determine the value of the standard deviation of the yield of milk.

(c) Determine the value of the standard deviation of the percentage fat content of milk.

(d) Compare the dispersion of the yield of milk and of the percentage fat content of milk.

50. Absolute and relative dispersion. Data expressed in unlike units. (Data of Tables 21 and 22. Referring to the source of these tables, the instructor can obtain a large number of similar individual problems.)

(a) Show graphically the distributions of height and weight.

(b) Determine the value of the standard deviation of height.

(c) Determine the value of the standard deviation of weight.

(d) Compare the dispersion of height and of weight.

51. Positive skewness. (Data of Table 13.)

(a) Show graphically the distribution of the salaries of visitors and visitors-in-training in family welfare organizations.

(b) Determine the value of the Pearsonian coefficient of skewness.

52. Positive skewness. (Data of Table 18.)

(a) Show graphically the distribution of the weekly earnings of women in the men's clothing industry of Mississippi, 1925.

(b) Determine the value of the Pearsonian coefficient of skewness.

53. Negative skewness. (Data of Table 14.)

(a) Show graphically the distribution of the weekly earnings of women working as hand sewers on coats, in Cleveland, 1926.

(b) Determine the value of the Pearsonian coefficient of skewness.

54. Negative skewness. (Data of Table 23.)

(a) Show graphically the distribution of draft of commercial vessels passing through the Panama Canal from the Pacific to the Atlantic, in 1926.

(b) Determine the value of the Pearsonian coefficient of skewness.

IV

THE NORMAL CURVE OF ERROR

55. Probability. Random occurrence as shown by coin tossing.

(a) Select five coins of the same denomination, taking care to avoid using any that are perceptibly imperfect. Toss the coins 200 times, shaking them before each toss. Tabulate the number of heads which appears at each throw.

(b) Express the frequency of appearance of each number of heads as a per cent of the total number of throws, and show the results graphically.

(c) From Appendix B obtain the theoretical distribution of number of heads and plot the data on the graph of (b) in terms of percentages.

Note: The results of 200 throws are not likely to show a high degree of correspondence to the theoretical distribution. Closer correspondence may be obtained by combining a number of such samples.

56. Probability. Random occurrence as shown by coin tossing.

(a) Select eight perfect coins of the same denomination. Toss the coins 150 times, shaking them before each toss. Tabulate the number of heads which appears at each throw.

(b)–(c) Procedure identical with that of Exercise **55.**

Note: A closer degree of correspondence may be obtained by combining a number of these samples of 150 throws.

57. Variability of the mean when determined from successive samples. (Data of Table 1. Other exercises of this nature may be based upon the similar data of Table 2, or upon the payroll data of Table 3, as a whole or by departments.)

(a) Enter on metal rimmed discs the amounts spent for meals, as found in Table 1. The purpose of entering the data on discs is to facilitate the selection of random samples. If it is not feasible to transfer the data to discs this exercise may be performed by selecting the items at random directly from the table.

(b) Mix the discs thoroughly and take a random sample of 30 items.

(c) Compute the mean of the sample.

(d) Replace the discs drawn out (in order that the total may remain the same as before) and repeat the process until 25 means have been computed from similar samples.

(e) Compute the mean of all the items of Table 1 and compare it with the 25 means obtained from samples. A few of these sample means may be expected to depart rather widely from the true mean, also there should be a tendency to cluster closely about the true mean. The more samples taken, and the greater the size of the sample, the more regular will be this distribution of sample means about the true mean.

(f) Compute the mean of the 25 sample means, and compare this value with that of the true mean.

58. Fitting the normal curve and determining theoretical frequencies. (Data of Table 24.)

(a) Fit a normal curve to the frequency distribution of per cent butter fat content of milk from 163 Guernsey cows of imported sires. Erect ordinates at intervals of .25 σ. (Ordinates are given in Appendix C.)

(b) Draw a graph showing the original curve and the fitted curve.

(c) In general what proportion of Guernsey cows of imported sires might be expected to produce milk registering a butter fat content of less than 4.4 per cent?

(d) What proportion might be expected to fall between 4.6 and 5.2 per cent?

(e) Determine the theoretical frequencies for each class interval of the distribution. If desired a test of goodness of fit may be made. (The procedure for determining the theoretical frequencies, as well as that for testing the fit, is described in Appendix A.)

59. Fitting the normal curve and determining theoretical frequencies. (Data of Table 17.)

(a) Fit a normal curve to the frequency distribution of amounts spent for evening meals on six week days. Erect ordinates at intervals of .25 σ. (Ordinates in Appendix C.)

(b) Draw a graph showing the original curve and the fitted curve.

(c) If the cafeteria should establish its minimum sale at 35 cents for a meal, what proportion of the patrons might be discouraged?

(d) If desired the theoretical frequencies for each class interval may be determined, and a test of goodness of fit may be made. (For both procedures see Appendix A.)

60. Fitting the normal curve and determining theoretical frequencies. (Data of Table 25.)

(a) Fit a normal curve to the frequency distribution of weights of white boys, one and under two months of age. Erect ordinates at intervals of .25 σ. (Ordinates in Appendix C.)

(b) Draw a graph showing the original curve and the fitted curve.

(c) In general what proportion of male white infants of this age might be expected to weigh 9 pounds or less?

(d) What proportion might be expected to weigh between 10 and 12 pounds?

(e) Determine the theoretical frequencies for each class interval of the distribution. If desired a test of goodness of fit may be made. (For both procedures see Appendix A.)

61. Fitting the normal curve and determining theoretical frequencies. (Data of Table 26.)

(a) Fit a normal curve to the frequency distribution of sizes of women's wedding rings, which may rightly be considered as a continuous series. Erect ordinates at intervals of .25 σ. (Ordinates in Appendix C.)

(b) Draw a graph showing the original curve and the fitted curve.

(c) Determine the theoretical frequencies for each class interval of the distribution. If desired a test of goodness of fit may be made. (Both procedures are described in Appendix A.)

(d) A manufacturing jeweler wishes to put on the market 15,000 women's wedding rings of a new design. Present a table showing the number of each size he should manufacture.

(e) What sizes would you suggest that a retail jeweler should stock? Why?

62. Fitting the normal curve and determining theoretical frequencies. (Data of Tables 27 and 28.)

(a) Fit a normal curve to the frequency distribution of neck cir-

cumference of white troops at demobilization. Erect ordinates at intervals of .25 σ. (Ordinates in Appendix C.)

(b) Draw a graph showing the original curve and the fitted curve.

(c) In general what proportion of white troops could be expected to have a neck circumference of 15 inches or more (1 centimeter = .3937 inch)?

(d) What proportion might be expected to fall between 13.5 and 15.5 inches circumference?

(e) Determine the theoretical frequencies for each class interval of the distribution. If desired a test of goodness of fit may be made. (Both procedures are described in Appendix A.)

(f) Upon the basis of the theoretical frequencies of (e) determine the distribution of collar sizes of shirts that might be used as a manufacturing schedule. Consider sizes from 13 to 18 inches, by half-sizes, and a total output of 100,000 shirts. Compare your results with the manufacturing schedule of a prominent shirt company (Table 28). In making this comparison it should be remembered that the army data represent a selected group.

63. Unreliability of the arithmetic mean and of the standard deviation.

(a) In *The Medical Department of the United States Army in the World War*, Vol. XV, Part I, p. 101, the mean height of 9759 draft recruits from the "Twin Cities" area of Minnesota is given as 67.83 inches. The standard deviation of the height of these recruits was 2.63 inches. Determine the value of the standard error and of the probable error of the mean. The value of the mean should be written $\pm P.E._{M}$. What do the standard error and the probable error signify as to the reliability of the mean height of draft recruits from this area?

(b) Determine the value of the standard error of the standard deviation and of the probable error of the standard deviation. The value of the standard deviation should be written $\pm P.E._{\sigma}$. What do the standard error and the probable error signify as to the reliability of the standard deviation of height of draft recruits from this area?

Note: Further data of this nature, useful in illustrating the unreliability of the mean and of the standard deviation may be found in the table referred to in (a).

64. Unreliability of the arithmetic mean and of the standard deviation. (Data of Table 14.)

(a) Determine the value of the mean and of the standard deviation of the weekly earnings of women working as hand sewers on men's coats in Cincinnati.

(b) Determine the value of the standard error of the mean and of the probable error of the mean. The value of the mean should be written $\pm P.E._{M}$. If a number of similar samples of the same size as the original data of (a) are taken, what variations may be expected in the value of the arithmetic mean?

(c) Determine the value of the standard error of the standard deviation and of the probable error of the standard deviation. The value of the standard deviation should be written $\pm P.E._{\sigma}$. If a number of samples are taken, within what limits may the value of the standard deviation be expected to vary?

(d) If a number of samples are taken, within what limits may 90 per cent of the means be expected to fall?

65. Unreliability of the arithmetic mean and of the standard deviation. (Data of Table 14.)

(a) Determine the value of the mean and of the standard deviation of the weekly earnings of women working as hand sewers on men's coats in Cleveland. (Exercise **47.**)

(b)–(c) Procedure identical with that of Exercise **64.**

(d) If a number of samples are taken, within what limits may 60 per cent of the means be expected to fall?

66. Unreliability of the arithmetic mean and of the standard deviation. (Data of Table 18.)

(a) Determine the value of the mean and of the standard deviation of the weekly earnings of women in five-and-ten-cent stores in Mississippi.

(b)–(c) Procedure identical with that of Exercise **64.**

(d) If a number of samples are taken, within what limits may 80 per cent of the means be expected to fall?

67. Unreliability of the arithmetic mean and of the standard deviation. (Data of Table 18.)

(a) Determine the value of the mean and of the standard deviation

of the weekly earnings of women in the men's clothing industry of Mississippi. (Exercise **48.**)

(b)–(c) Procedure identical with that of Exercise **64.**

(d) If a number of samples are taken, within what limits may 95 per cent of the means be expected to fall?

68. Unreliability of the arithmetic mean and of the standard deviation. (Data of Table 29.)

(a) Determine the value of the mean and of the standard deviation of the per cent fat content of milk from 1295 cows, as shown by the seven-day test of the Agricultural Experiment Station of the University of Illinois.

(b)–(c) Procedure identical with that of Exercise **64.**

(d) If a number of samples are taken, within what limits may 70 per cent of the means be expected to fall?

69. Unreliability of the difference between the means of two samples drawn from different populations. (Data of Table 14.)

(a) Determine the value of the mean weekly earnings of women, working as hand sewers on men's coats in Cleveland. Compute a like value for Cincinnati.

(b) Compute the standard error of each of these means (Exercises **64** and **65**) and the standard error of the difference between these two means.

(c) Is the observed difference significant, or may it be due to chance?

Note: Put in the following form this question requires a quantitative answer: If the true difference between the means is zero, what are the probabilities that, due to pure chance, a difference equal to or greater than the observed difference may occur?

70. Unreliability of the difference between the means of two samples drawn from different populations. (Data of Table 14.)

(a) Determine the value of the mean weekly earnings of women, working as hand sewers on men's coats in Cincinnati. Compute a like value for St. Louis.

(b) Compute the standard error of each of these means (Exercise **64**) and the standard error of the difference between these two means.

(c) Is the observed difference significant, or may it be due to chance? See Note to Exercise **69**–(c).

71. Unreliability of the difference between the means of two samples drawn from different populations. (Data of Table 18.)

(a) Determine the value of the mean weekly earnings of women in five-and-ten-cent stores in Mississippi. Compute a like value for women in the men's clothing industry of Mississippi.

(b) Compute the standard error of each of these means (Exercises **66** and **67**) and the standard error of the difference between these two means.

(c) Is the observed difference significant, or may it be due to chance? See Note to Exercise **69**–(c).

72. Unreliability of the difference between the means of two samples drawn from different populations. (Data of Table 18.)

(a) Determine the value of the mean weekly earnings of women in five-and-ten-cent stores in Mississippi. Compute a like value for women in the textile industry of Mississippi.

(b) Compute the standard error of each of these means (Exercise **66**) and the standard error of the difference between these two means.

(c) Is the observed difference significant, or may it be due to chance?
See Note to Exercise **69**–(c).

73. Unreliability of the difference between the means and the difference between the standard deviations of two samples drawn from the same population. (Data of Table 30.)

(a) Determine the value of the mean butter-fat production of cows as shown by the continuous test, and the value of the mean for the semi-official test.

(b) Compute the standard error of each of these means, and the standard error of the difference between these two means.

(c) Is the observed difference significant or may it be due to chance? If the continuous test be regarded as the standard, can the semi-official test be used with confidence that it will produce approximately the same results?

(d) A like comparison may be made between the dispersions of the two tests, considering their standard deviations and the standard error of the difference between these two measures.

74. Unreliability of the difference between the means and the difference between the standard deviations of two samples drawn from the same population. (Data of Table 29.)

(a) Determine the value of the mean fat content of milk as shown by the semi-official (long-time) test, and the value of the mean for the seven-day test.

(b) Compute the standard error of each of these means (Exercise **68**) and the standard error of the difference between these two means.

(c) Is the observed difference significant, or may it be due to chance? If the semi-official test be regarded as the standard, can the seven-day test be used with confidence that it will produce approximately the same results?

(d) A like comparison may be made in respect to the dispersions of the two tests as shown by their standard deviations and the standard error of the difference between these two measures.

75. Unreliability of the difference between the means of two samples drawn from the same population.

(a) A survey of rents in a city reveals that a certain type of house commands an average monthly rental of \$35.50. The survey covered 100 dwellings, and the standard deviation of the monthly rentals was \$5.20. In order to test the stability of this average rental a second sample of 100 was studied. This sample gave a mean rental of \$36.20 and a standard deviation of \$6.40. Assuming the samples to have been chosen at random, is the difference between these means significant?

(b) If for the first sample of 100 the results had been $M_1 = \$36.00$, $\sigma_1 = \$3.80$, and for the second sample $M_2 = \$37.80$, $\sigma_2 = \$4.20$, what could be said concerning the significance of the difference between the two means?

V

INDEX NUMBERS[1]

76. Graphic representation of index numbers. (Data of Table 31.)

(a) Plot on the same axes the index numbers of raw materials, semi-manufactured articles, and finished products, by months, January, 1923, to January, 1928.

(b) Comment on the three curves.

77. Frequency distributions of price relatives. The problem of combining a number of price fluctuations. (Data of Table 32.)

(a) Choose a class interval of proper size and classify the 83 price relatives for 1914 in the form of a frequency distribution.

(b) Construct similar frequency distributions of the price relatives for 1920 and for 1926.

(c) Compare the distribution of price relatives for the three years. Do these distributions throw light upon the problem of combining price fluctuations into a single value for a given year or month?

(d) Construct a frequency distribution of the price relatives of 1920 when based upon 1919 as 100 instead of 1913. Compare the dispersion of this distribution with that for the 1920 relatives when based on 1913 as in (b).

78. Comparison of methods of constructing index numbers. (Data of Table 33.)

(a) Select a base, to be approved by the instructor, and construct an index number of the wholesale price of California citrus fruits by the method of:

(1) Aggregate values, unweighted;

(2) Arithmetic average of relatives, unweighted;

(3) Aggregate values, weighted;

(4) Arithmetic average of relatives, weighted;

[1] Material for a variety of exercises on construction of index numbers will be found in *Wholesale Prices, 1890 to 1926*, published by the United States Bureau of Labor Statistics as Bulletin 440.

(5) Geometric average of relatives, unweighted.

(b) Compare and explain the differences in results. Which of these indexes is preferable?

(c) Construct an unweighted or weighted chain index number. What are the advantages and disadvantages of this form?

79. Comparison of methods of constructing index numbers. (Data of Table 34.)

(a) Select a base, to be approved by the instructor, and construct an index number of the wholesale price of leather by the method of:

(1) Aggregate value, unweighted;

(2) Arithmetic average of relatives, unweighted;

(3) Aggregate values, weighted;

(4) Arithmetic average of relatives, weighted;

(5) Geometric average of relatives, unweighted.

(b) Compare and explain the differences in results. Select the index which is preferable.

(c) Construct an unweighted or weighted chain index number. What are the advantages and disadvantages of this form?

80. Comparison of methods of constructing index numbers. (Data of Table 35.)

This table presents annual data, 1913 to 1926, of both prices and quantity, for certain of the more important farm crops. It provides material for the construction of price and production index numbers of practically any type desired.

81. Deflation of index of dollar sales to obtain index of physical volume of sales.

See Exercise **125.**

VI

CORRELATION

82. The scatter diagram. High positive correlation. (Data of Table 36.)

(a) Construct a scatter diagram of average value of farm crops per acre (X) and average value of land per acre (Y) for the counties of Illinois, 1925.

(b) Comment upon the scatter plot.

(c) Would you expect to find the same general relationship between these two factors in other States?

83. The scatter diagram. Low correlation. (Data of Table 37.)

(a) Construct a scatter diagram of the per capita expenditure for schools (X) and the per capita expenditure for recreation (Y) in cities of 100,000 or more inhabitants, 1925.

(b) Comment upon the scatter plot.

84. The scatter diagram. High negative correlation. (Data of Table 38.)

(a) Construct a scatter diagram of per cent native white (X) and per cent illiterate (Y) in the population of Pennsylvania by counties, 1920.

(b) Comment upon the scatter plot.

85. A graphic determination of the approximate value of the coefficient of correlation. (Data of Table 36.)

(a) Construct a correlation table of the data of average value of farm crops per acre (X) and average value of land per acre (Y) for the counties of Illinois, 1925. (Omit Cook and Lake counties, which are largely urban.)

(b) Compute the mean of the Y values for each group on the X axis. These are the means of the columns of the table when each column is considered as a separate frequency distribution.

(c) Plot a curve of the means of the columns.

(d) By inspection, fit a straight line to the means shown graphically in (c). This is the line of regression of Y on X.

(e) Determine the slope (m_1) of this straight line.

$$y = m_1 x \text{ and } m_1 = \frac{y}{x}$$

(f) Determine the value of r from,

$$r = \frac{y \div \sigma_Y}{x \div \sigma_X}.$$

A more precise value for r will be obtained in Exercise **95.**

Note: The line of regression of X on Y may be fitted by inspection to the means of the rows of the correlation table; m_2 may be determined ($m_2 = \frac{x}{y}$); and a value for r may be obtained from,

$$r = \frac{x \div \sigma_X}{y \div \sigma_Y}.$$

The two values for r should be in substantial agreement.

86. A graphic determination of the approximate value of the coefficient of correlation. (Data of Table 39.)

(a) A correlation table of the per cent of votes on woman suffrage cast in favor of suffrage (X) and the per cent of votes on the prohibition question cast in favor of prohibition (Y) is presented as Table 39.

(b)–(f) Procedure identical with that of Exercise **85.** A more precise value for r will be obtained in Exercise **93.**

87. A graphic determination of the approximate value of the coefficient of correlation. (Data of Table 36.)

(a) Construct a correlation table of the data of average improved acreage per farm (X) and average value of land and buildings per farm (Y) for the counties of Illinois, 1920. (Omit Cook and Lake counties, which are largely urban.)

(b)–(f) Procedure identical with that of Exercise **85.** A more precise value for r will be obtained in Exercise **99.**

88. Determination of coefficient of correlation from grouped data. Positive correlation. (Data of Table 40.)

(a) Make a scatter diagram of per cent negro (X) and per cent illiterate ten years of age or over (Y) in the population of Mississippi by counties, 1920.

(b) Construct a correlation table.

(c) Determine the value of r and of $P.E._r$.

(d) State the regression equations in terms of x, y and in terms of X, Y.

(e) Determine the values of S_Y and S_X.

(f) Show graphically, on the scatter plot of (a), the regression line Y on X, and indicate the zones of $\pm 1\,S$, $\pm 2\,S$, and $\pm 3\,S$.

(g) What proportion of the cases, represented by the dots of the scatter plot, fall within $\pm 1\,S$ of the line of regression of Y on X?

(h) Assume a value for X and, by means of the regression equation, estimate the corresponding value for Y. Indicate the reliability of your estimate.

(i) Explain the significance of the coefficient of correlation which you have computed.

89. Determination of coefficient of correlation from grouped data. Negative correlation. (Data of Table 40.)

(a) Make a scatter diagram of per cent native white (X) and per cent illiterate ten years of age or over (Y) in the population of Mississippi by counties, 1920.

(b)–(i) Procedure identical with that of Exercise **88.**

90. Determination of coefficient of correlation from grouped data. Positive correlation. (Data of Table 41.)

(a) A correlation table of points on mental test (X) and per cent of standard production (Y) attained by employees of a clothing plant, is presented as Table 41.

(b) Determine the value of r and of $P.E._r$.

(c) State the regression equations in terms of x, y and in terms of X, Y.

(d) Determine the values of S_Y and S_X.

(e) Assume a value for X and, by means of the regression equation,

estimate the corresponding value for Y. Indicate the reliability of your estimate.

(f) Explain the significance of the correlation coefficient which you have computed.

(g) To what extent does this mental test assist the employment manager in selecting employees?

91. Determination of coefficient of correlation from grouped data. Positive correlation. (Data of Table 36.)

(a) Make a scatter plot of average acreage per farm (X) and per cent of farms operated by tenants (Y) for the counties of Illinois, 1920. (Omit Cook and Lake counties, which are largely urban.)

(b)–(i) Procedure identical with that of Exercise **88.**

92. Determination of coefficient of correlation from grouped data. Negative correlation. (Data of Table 36.)

(a) Make a scatter plot of average acreage per farm (X) and per cent of farms operated by owners (Y) for the counties of Illinois, 1920. (Omit Cook and Lake counties, which are largely urban.)

(b)–(i) Procedure identical with that of Exercise **88.**

93. Determination of coefficient of correlation from grouped data. Positive correlation. (Data of Table 39.)

(a) A correlation table of the per cent of votes on woman suffrage cast in favor of suffrage (X) and the per cent of votes on the prohibition question cast in favor of prohibition (Y) is presented as Table 39.

(b)–(f) Procedure identical with that of Exercise **90.**

94. Determination of coefficient of correlation from grouped data. Positive correlation. (Data of Table 42.)

(a) A correlation table of height (X) and weight (Y) of a group of white boys, aged 9 and under 12 months, is given as Table 42.

(b)–(f) Procedure identical with that of Exercise **90.**

95. Determination of coefficient of correlation from grouped data. Positive correlation. (Data of Table 36.)

(a) Make a scatter diagram of average value of farm crops per acre (X) and average value of land per acre (Y) for the counties of Illinois, 1925. (See Exercise **82**-(a).)

(b)-(i) Procedure identical with that of Exercise **88.** (Cook and Lake counties should be omitted because they are largely urban.)

(j) Would you expect to find the same general relationship between these two factors in other States?

96. Determination of coefficient of correlation from ungrouped data. Positive correlation. (Data of Table 43.)

(a) Make a scatter diagram of average value of crops per acre (X) and average value of land per acre (Y) in the counties of Wyoming, 1925.

(b) Determine the value of r and $P.E._r$.

(c) Give the regression equations in terms of x, y and in terms of X, Y.

(d) Determine the values of S_Y and S_X.

(e) Show graphically, on the scatter plot of (a), the regression line Y on X, and indicate the zone of $\pm 1\ S$.

(f) What proportion of the cases, represented by the dots of the scatter plot, fall within $\pm 1\ S$ of the line of regression Y on X?

(g) Assume a value for X and, by means of the regression equation, estimate the corresponding value for Y. Indicate the reliability of your estimate.

(h) Explain the significance of the coefficient of correlation which you have computed.

(i) Would you expect to find the same general relationship between these two factors in other States?

97. Determination of coefficient of correlation from ungrouped data. Positive correlation. (Data of Table 44.)

(a) Make a scatter diagram of average value of crops per acre (X) and average value of land per acre (Y) in the counties of North Dakota, 1925.

(b)-(i) Procedure identical with that of Exercise **96.**

98. Determination of coefficient of correlation from ungrouped data. Negative correlation. (Data of Table 45.)

(a) Make a scatter diagram of margin of safety (X) and yield (Y) of the public utility bonds listed in Table 45.

(b)–(h) Procedure identical with that of Exercise **96.**

99. Determination of coefficient of correlation from ungrouped data. Positive correlation. (Data of Table 36.)

(a) Make a scatter diagram of average improved acreage per farm (X) and average value of land and buildings per farm (Y) in the counties of Illinois, 1920. (Omit Cook and Lake counties, which are largely urban.)

(b)–(h) Procedure identical with that of Exercise **96.**

100. Determination of coefficient of correlation from ungrouped data. Negative correlation. (Data of Table 38.)

(a) Make a scatter diagram of per cent native white (X) and per cent illiterate (Y) in the population of Pennsylvania by counties, 1920. (See Exercise **84**–(a).)

(b)–(h) Procedure identical with that of Exercise **96.**

101. Non-linear correlation. The correlation ratio. Presence of a significant difference between η and r. (Data of Table 46.)

(a) Make a scatter diagram of average acreage per farm (X) and average value of land per acre (Y) in the counties of Nebraska, 1925.

(b) Construct a correlation table. (Douglas, Cherry, and Grant counties are extreme variants. For the sake of simplifying the problem these counties may be omitted.)

(c) Determine the value of r.

(d) Determine the value of η_{XY}.

(e) Test for non-linearity.

Note: If desired η_{YX} may also be computed and a second test for non-linearity may be made. Attention is called to the possibility of computing a generalized index of correlation. (See Mills, *Statistical Methods*, p. 436 f.)

102. Non-linear correlation. The correlation ratio. Difference between η and r not significant. (Data of Table 36.)

(a) Make a scatter diagram of average value of farm crops per acre (X) and average value of land per acre (Y) in the counties of Illinois, 1925. (See Exercise **82**–(a).)

(b) Construct a correlation table. Omit Cook and Lake counties which are largely urban. (See Exercise **95**–(b).)

(c) Determine the value of r. (See Exercise **95**–(c).)

(d) Determine the value of η_{YX} or η_{XY}.

(e) Test for linearity.

103. Rank correlation. Comparison of ρ and r. (Data of Table 47.)

(a) Make a scatter diagram of the data of per cent negro (X) and per cent illiterate (Y) in the states of the South Atlantic, East South Central, and West South Central divisions of the United States, 1920.

(b) Determine the value of r.

(c) Determine the value of ρ and compare with that of r. Account for the difference in the two values.

(d) Using the Pearsonian correction (Appendix E), convert ρ to r. Compare this value of r with that obtained in (b) and account for the difference.

(e) Of what practical value is ρ?

104. Rank correlation. Comparison of ρ and r. (Data of Table 48.)

(a) Make a scatter diagram of the data of average number of wage earners (X) and value added by manufacture (Y) in the fifteen industrial groups as classified by the Bureau of the Census, 1925.

(b)–(e) Procedure identical with that of Exercise **103.**

VII

TIME SERIES

105. Secular trend. Determination by inspection and by moving average. (Data of Table 49.)

(a) Show graphically the annual production of potatoes in the United States, 1905–27.

(b) Draw a free-hand curve to represent the trend of the series.

(c) Show graphically the trend of the series as described by a five-year moving average.

106. Secular trend. Mathematical description.[1] Straight line fit to odd number of items, upward trend. (Data of Table 49.)

(a) Show graphically the annual production of potatoes in the United States, 1905–27.

(b) Determine the equation of a straight line fitted to the annual data and represent this trend on the graph of (a).

107. Secular trend. Mathematical description.[1] Straight line fit to even number of items, downward trend. (Data of Table 49.)

(a) Show graphically the annual production of buckwheat in the United States, 1914–27.

(b) Determine the equation of a straight line fitted to the annual data and represent this trend on the graph of (a).

108. Secular trend and its elimination. Mathematical description.[1] Straight line fit to odd number of items. (Data of Table 49.)

(a) Show graphically the wholesale value of passenger automobiles produced in the United States, 1915–27.

(b) Fit a straight line to the series and represent this trend on the graph of (a).

(c) Express the value for each year as a per cent of the corresponding trend value. Show graphically the wholesale value of passenger automobiles expressed as per cent of trend or as per cent deviation from trend.

[1] Tables of the sums of the squares of the first one hundred natural numbers and of the first one hundred odd natural numbers will be found in Appendices F and G.

109. Secular trend and its elimination. Mathematical description.[1] Straight line fit to even number of items. (Data of Table 49.)

(a) Show graphically the annual production of pig iron in the United States, 1902–27.

(b) Fit a straight line to the series and represent the trend on the graph of (a).

(c) Express the value for each year as a per cent of the corresponding trend value. Show graphically the production of pig iron expressed as per cent of trend or as per cent deviation from trend.

110. Secular trend and its elimination. Mathematical description.[1] Straight line fit to even number of items. (Data of Table 49.)

(a) Show graphically the annual production of steel ingots and castings in the United States, 1902–27.

(b) Fit a straight line to the series and represent the trend on the graph of (a).

(c) Express the value for each year as a per cent of the corresponding trend value. Show graphically the production of steel ingots and castings as per cent of trend or as per cent deviation from trend.

111. Secular trend and its elimination. Mathematical description.[1] Straight line fit to even number of items. (Data of Table 49.)

(a) Show graphically the per cent change over previous year of production of cars and trucks in the United States, 1902–27.

(b) Fit a straight line to the series and represent the trend on the graph of (a).

(c) Express the value for each year as a per cent of the corresponding trend value. Show graphically the per cent change over previous year as per cent of trend or as per cent deviation from trend.

112. Secular trend and its elimination. Mathematical description.[1] Straight line and parabolic fit to odd number of items. (Data of Table 50.)

[1] Tables of the sums of the squares of the first one hundred natural numbers and of the first one hundred odd natural numbers will be found in Appendices F and G.

(a) Show graphically the production of passenger cars in the United States, 1914–26.

(b) Fit a straight line to the series and represent the trend on the graph of (a).

(c) Fit a curve of the type $Y = a + bX + cX^2$ and represent the trend on the graph of (a).

(d) Express the value for each year as a per cent of the corresponding straight-line-trend value. Show the results graphically.

(e) Express the value for each year as a per cent of the corresponding parabolic-trend value. Show the results on the graph of (d).

(f) Which of these two forms of curves seems better to represent the trend of the original data?

(g) If the data for 1913 and 1927 are included would a straight line or a parabola be preferable?

113. Comparison of trends. (Data of Table 51.)

(a) Show graphically, on the same axes, the annual suicide rates according to the age groups 10–19, 20–29, 30–59, and 60 years and over.

(b) Determine the trend for each of the four age groups, and plot them on the graph of (a).

(c) For comparison, show the four trend lines on semi-logarithmic paper.

(d) Comment upon the relation of these trends to each other when shown as in (b) and (c).

114. Comparison of trend with population growth. (Data of Table 52.)

(a) Show graphically the annual production of potatoes in the United States, 1870–1926.

(b) Determine the trend of the series and plot it on the graph of (a).

(c) For comparison, show on the same axes, on natural scale paper, the trend line of potato production and the population of the United States, 1870–1926.

(d) Compare the trend of potato production with population on semi-logarithmic paper.

(e) Comment upon the relationships as shown in (c) and (d).

115. Graphic representation of a series showing clearly defined seasonal

movements and elimination of these movements. (Data of Table 53.)

(a) Show graphically the data of monthly disappearance into trade ("consumption") of butter in the United States, 1917–27. Note the marked recurring movements within each year.

(b) Determine an index of seasonal variation and eliminate the seasonal fluctuations from the original data. This leaves in the series all factors except seasonal.

(c) The data of (b) represent the disappearance into trade of butter, adjusted for seasonal variations. Plot these data on the graph of (a).

116. Determination of cyclical movements. Elimination of trend and seasonal fluctuations from monthly data. (Data of Table 54.)

(a) Show graphically the data of monthly pig iron production in the United States, 1907–27.

(b) Determine the trend of the series. Express the original data in terms of per cent of trend and show these figures graphically.

(c) Determine an index of seasonal variation, and eliminate the seasonal fluctuations from the per cent of trend values of (b).

Note: The determination of seasonal movements involves two preliminary considerations, that of the existence of a seasonal movement, and that of the constant or changing nature of this movement if it does exist. It is suggested that seasonal indexes be computed by several methods and that the results be compared in the light of the original data.

(d) Show graphically the results of (c). This represents the residual factors after the elimination of trend and seasonal movements. For comparison with other series, these residuals may be expressed in terms of σ units on the vertical scale.

117. Determination of cyclical movements. Elimination of trend and seasonal fluctuations from monthly data. (Data of Table 55.)

(a) Show graphically the data of monthly motor vehicle production in the United States, 1913–27.

(b)–(d) Procedure identical with that of Exercise **116.**

118. Determination of cyclical movements. Elimination of trend and seasonal fluctuations from monthly data. (Data of Table 56.)

(a) Show graphically the data of monthly freight ton-miles in the United States, 1918–27.

(b)–(d) Procedure identical with that of Exercise **116.**

119. Determination of cyclical movements. Elimination of trend and seasonal fluctuations from monthly data. (Data of Table 57.)

(a) Show graphically the monthly index of sales of 5-and-10-cent stores, 1919–27.

(b)–(d) Procedure identical with that of Exercise **116.**

120. Determination of cyclical movements. Elimination of trend and seasonal fluctuations from monthly data. (Data of Table 58a.)

(a) Show graphically the data of unfilled orders of the United States Steel Corporation, 1911–27.

(b)–(d) Procedure identical with that of Exercise **116.**

121. Correlation of time series. Comparison of coefficients obtained from original data and from data expressed in terms of per cent deviation from trend. (Data of Table 50.)

(a) Show graphically, on the same axes, the data of production of beehive coke and of production of by-product coke in the United States, 1913–27.

(b) Determine the value of the coefficient of correlation between these two series of original data.

(c) Determine the trend (linear) of each of these series and express the original data in terms of per cent deviation from trend.

(d) Make a scatter diagram of the per cent deviations from trend of the two series. Locate a dot for each pair of deviations.

(e) Determine the coefficient of correlation between the two series when expressed in terms of per cent deviation from trend.

(f) Interpret the difference between the two coefficients of correlation obtained above.

(g) If in a given year the production of beehive coke is 10 per cent below trend what may be expected of the production of by-product coke?

122. Determination of coefficient of correlation between two series of link relatives. (Data of Table 59.)

It is desired to obtain figures which will indicate the monthly fluctuations in employment in the iron and steel industry of Ohio. In this industry there are more than 1600 establishments. Steel works and rolling mills, one division of the iron and steel industry, is represented by about 60 firms. In order to save time and money in collecting the data of employment it is desired to ascertain if the fluctuations in employment in steel works and rolling mills are indicative of the fluctuations of employment in the iron and steel industry as a whole.

(a) Make a scatter diagram of the data of monthly link relatives of employment in steel works and rolling mills (X) and of monthly link relatives of employment in the entire iron and steel industry (Y) of Ohio.

Note: These data cover only the four years 1920, '21, '23, and '24, the data not being available for 1922. No link relatives are shown for January because the data were collected at the end of each year for the preceding twelve months and included a different number of firms for each successive year.

(b) Determine the value of r, data ungrouped.

(c) Assume a value for X and estimate the corresponding value for Y.

(d) As a result of the above analysis would you conclude that the fluctuations of employment in steel works and rolling mills in Ohio could be taken to represent the fluctuations of employment in the entire iron and steel industry in Ohio?

123. Determination of lag or lead between time series. (Data of Tables 58a and 58b.) A number of individual exercises may be based on the various monthly time series included in the tables in this book. Many more such series may be found in the *Survey of Current Business*, the *Federal Reserve Bulletin*, and the *Statistical Bulletin, 1928-1929 Biennial Issue* of the Standard Statistics Company.

(a) Show graphically, on separate sheets of coördinate paper, the movements of unfilled orders of the United States Steel Company and of the interest rate on 4–6 months commercial paper, 1918–27.

(b) Examine these series carefully to (1) form a preliminary opinion of the number of months by which the cyclical movements of one of the series seem to precede those of the other and (2)

ascertain if any adjustments are necessary for trend and seasonal movements.

(c) If necessary, adjust the two series for secular and seasonal movements. Show the adjusted series graphically on separate sheets of coördinate paper.

(d) Compare the curves of the adjusted series and again estimate the number of months by which one series leads the other. Determine the value of the coefficient of correlation between the two adjusted series with the estimated amount of lead. Ascertain other coefficients with leads of more or fewer months, until a maximum value for the coefficient is obtained. Time may be saved by making a number of scatter plots for various amounts of lead and by using these to indicate what coefficients should be calculated.

(e) Interpret the results obtained in (d).

124. Deflation of a series of annual data by means of a price index. (Data of Table 50.)

(a) Show graphically the data of average amount per depositor in savings banks in the United States and Outlying Possessions, 1913–26.

(b) Using the United States Bureau of Labor Statistics index of retail food prices, express the savings per depositor for each year in terms of 1913 dollars. Note that the index of food prices is here taken as indicative of retail prices as a whole. This, of course, is not strictly true.

(c) Plot the data of (b) on the graph of (a) and compare the two curves.

125. Deflation of a series of monthly data by means of a price index. (Data of Tables 60 and 61.)

(a) Show graphically the index of dollar sales of groceries at wholesale, 1919–26.

(b) Shift the base of the United States Bureau of Labor Statistics index of wholesale food prices from 1913 to 1919 (i.e., let the average index for 1919, which was 206.6, equal 100), and express the index of monthly sales of groceries in terms of 1919 dollars. This reflects the changes in the physical volume of groceries sold at wholesale.

(c) Plot the data of (b) on the graph of (a) and compare the two curves.

VIII

COLLECTION OF DATA AND PRESENTATION IN TABLES

126. Census usage in the construction of tables. (Consult volumes of the 1910 and the 1920 Census of the United States.)

(a) How are totals emphasized?

(b) What is the purpose of footnotes?

(c) Can figures in the same column or row always be added to produce a meaningful vertical or horizontal total?

(d) What use is made of italics?

(e) Do you find any horizontal lines in the stub or body of the tables?

(f) What schemes are used to guide the eye in its movements from left to right?

(g) Notice that items in the stub and box head are usually arranged in some logical order. List the bases of classification that you observe.

(h) Does the nature of prefatory notes differ from that of footnotes?

127. Presentation by text and by table.

(a) Below is given a paragraph statement of data. Recast the figures into a table form. It is suggested that all lines be of uniform width and that, for the sake of simplicity, single lines be used throughout the table. Before proceeding with this section of the exercise read the statement through.

Average Number of Wage Earners and Value of Products, by States for the East North Central Division of the United States, 1921 and 1923

Of the five states listed in the East North Central Division, Ohio ranked first, in 1923, in point of average number of wage earners, 699,132 persons having been employed in that year. Illinois was a close second with 645,627 wage earners. In 1921 the relative positions of Ohio and Illinois were reversed, the former state having 494,288 wage earners

and the latter 513,876. The same relative positions were held by these two states in regard to value of products. In 1923 Ohio reported products valued at $5,146,514,777 and Illinois produced $5,041,113,314 worth of goods. In 1921 the value of products for Ohio was $3,300,693,256 and for Illinois was $3,705,379,662.

In the case of each of the states the number of wage earners and value of products increased in the two year interval. Michigan, for example, employing 304,471 wage earners in 1921, provided work for an industrial army 65.3 per cent larger in 1923. This same state, producing goods valued at $2,206,230,451 in 1921, increased that figure by 76.0 per cent in 1923.

Indiana and Wisconsin are approximately equal in importance both in regard to number of wage earners and value of products. Indiana employed 206,534 wage earners in 1921 and 291,131 in 1923, while Wisconsin employed 191,770 in 1921 and 247,851 in 1923. The value of products for Indiana was $1,377,772,071 in 1921 and $2,031,674,993 in 1923, and for Wisconsin was $1,214,860,521 in 1921 and $1,720,198,349 in 1923.

(b) What are the relative merits of text and tabular presentation?

128. Derived tables.

Refer to any one of the tables listed below. Construct a summary table to show the more important facts of the original table. Indicate the methods used in deriving the summary table.

Fourteenth Census (1920) of the United States:

(1) Vol. II, Table 11, p. 401 f., "Marital Condition of the Population 15 Years of Age and Over, by Sex and Age Periods, for Principal Population Classes, 1920, with Comparative Statistics, 1910 and 1900, by Divisions and States."

(2) Vol. V, Table 22, p. 318 f., "White Farm Operators, by Country of Birth, by Divisions and States, 1920 and 1910."

(3) Vol. VI, Part 1, 2, or 3, Table 32 for any state, "Summary for all Crops: 1919 and 1909."

(4) Vol. VII, State Table 1, p. 71 f., "Acres Harvested and

Production and Value of Principal Crops in 1919 on Irrigated Land for the States, and Acres Harvested, by Counties."

(5) Vol. VIII, Table 54, p. 298 f., "Detailed Statement for all Industries, by States: 1919."

(6) Vol. IX, Table 3 for any state, "Principal Industries, Ranked by Value of Products: 1919."

(7) Vol. X, Table 8 for any state, "Wage Earners, by Months, for Selected Industries and for Cities: 1919."

(8) Vol. XI, Table 3, p. 44 f., "Detailed Statistics for Mines, Quarries, and Wells, Producing and Non-Producing Enterprises, for the United States, by Industries, 1919."

129. Criticism of published tables.

(a) Consult statistical reports of state bureaus or tables in special investigations, either public or private. Sketch the form of any table which seems to have especially desirable features. State why you regard it as a good table.

(b) Sketch the form of any table which seems to have especially undesirable features. State what these faults are and suggest methods of improving the table.

130. Collection and presentation of industrial accident data.

(a) A model schedule, used by state labor departments for the collection of data from employers on industrial accidents, is shown in Chaddock, *Principles and Methods of Statistics*, page 379, or in Bulletin 276, United States Bureau of Labor Statistics, pages 21, 22.

(b) Bulletin 157, United States Bureau of Labor Statistics, gives examples of the variety of questions found in state accident schedules before standardization had been introduced. The following questions, taken from state accident schedules, are for your criticism:

(1) Was employee skilled in work at which injured?

(2) Was machinery properly guarded?

(3) Was machine in perfect state of repair?

(4) Was machine new or old?

(5) Degree of injury?

(6) Was injured intoxicated?

(7) Was injured in good health?

(8) Was accident caused by negligence or carelessness of injured employee?

(c) Refer to the standard schedule of (a), and draw up a series of table forms to present data which might be taken from a large number of these accident schedules after being filled in and returned to the collecting agency. What problems of definition and classification are encountered in drawing up these table forms?

Note: It will be interesting to compare the schedule used in your state with the model suggested in Bulletin 276. The annual report on industrial accidents in your state will supply tables for comparison with those you have drawn up and with those suggested in Bulletin 276.

131. Collection and presentation of mortality data.

(a) A standard death certificate, used by departments of health for registering deaths, is shown in Chaddock, *Principles and Methods of Statistics*, page 381. A copy of the certificate used in your community may be obtained from the local registrar of vital statistics.

(b) One of the most important questions on the certificate calls for the cause of death as certified by the attending physician. Criticize the following, given as causes of death:

(1) "Died suddenly at the age of 103."

(2) "Kick by horse showed on left kidney."

(3) "Chronic disease."

(4) "Delicate from birth."

(5) "Typhoid fever, bronchitis, pneumonia, . . ."

(See G. C. Whipple, *Vital Statistics.*)

(c) Refer to the standard schedule of (a), and draw up a series of table forms to present data which might be taken from a large number of these registration certificates after being filled in and returned to the registrar. Do any problems of definition and classification appear?

Note: A comparison may be made between the tables of (c) and those found in the annual report on vital statistics of the local or state health department.

132. Collection and presentation of employment data.

(a) A standard schedule for the collection of employment data is shown in *Employment Statistics for the United States*, R. G. Hurlin and W. A. Berridge, editors, page 78. Other schedules which may be compared with this standard form are given in the Appendix of the above volume.

(b) Draw up a series of table forms to present data which might be taken from a large number of the standard schedules of (a).

(c) Compare your table forms with the suggestions in Chapter 6 of *Employment Statistics for the United States.*

133. Collection of original data.

The planning and execution of a complete statistical study will give practice in constructing the schedule, gathering data, editing, tabulating, and interpreting the results. The subject of investigation will often be dictated by local conditions. As an example of such a study performed by students of statistics, see United States Bureau of Labor Statistics, Bulletin 409, *Unemployment in Columbus, Ohio, 1921–1925.*

Other suitable topics are:

(1) Industrial Survey — Types of manufactures, facilities, etc.

(2) Housing — Types of homes, crowding, rents, sanitary conditions, etc.

(3) Recreation — Commercial and non-commercial facilities.

(4) Retail Distribution of Food — Types of distributors and methods of sale of meat, milk, fruits and vegetables, and staple groceries.

134. Tabulation. Transferring and summarizing data from schedules.

(a) For the performance of this exercise the instructor should obtain for the use of the students a large number of filled-out schedules which have been used in an investigation.

(b) Draw up rough drafts of the tables which will best present the information gathered by the schedules.

(c) Prepare "rough-work" sheets and tally the data from the schedules. If preferred, the data may be assembled by sorting.

(d) Summarize the data in table form.

(e) Interpret and discuss the results.

IX

GRAPHIC METHODS

(For the graphic representation of frequency series, see Exercises **13–22,** Section III. Data for other time series will be found in Tables 49–61.)

135. Line diagram. Natural scale. (Data of Table 62. This table provides a large number of individual exercises.)

For the United States or for any one state designated by the instructor, show graphically the growth of automobile registrations.

136. Line diagram. Natural scale. (Data in *Abstract of the Fourteenth Census of the United States, 1920,* Table 6, pages 18, 19. These data may also be found in Vol. I of the Fourteenth Census, Table 8, page 20, and in the annual volumes of the *Statistical Abstract,* 1920, and later years. This material provides a large number of individual exercises.)

For the United States or for any one state designated by the instructor, show graphically the movement of population.

137. Line diagram. Natural scale. (Data of Table 63.)

Show graphically, by months, the movement of average weekly earnings in representative New York State factories.

138. Line diagram. Natural and semi-logarithmic scales. (Data of Table 62. This table provides a large number of individual exercises.)

(a) For the United States and any two states designated by the instructor, show graphically on the same axes the growth of automobile registrations. Use the same natural scale for all the series.

(b) Present the same data on graph paper having semi-logarithmic vertical scales. Use different vertical scale units in order to bring the curves close together for comparison.

(c) Comment on these two methods of graphic presentation.

139. Line diagram. Natural and semi-logarithmic scales. (Data in

Abstract of the Fourteenth Census of the United States, 1920, Table 6, pages 18, 19. These data may also be found in Vol. I of the Fourteenth Census, Table 8, page 20, and in the annual volumes of the *Statistical Abstract,* 1920 and later years. This material provides a large number of individual exercises.)

(a) For the United States and any two states designated by the instructor, show graphically on the same axes the movements of population. Use the same natural scale for all the series.

(b) Present the same data on graph paper having semi-logarithmic vertical scales. Use different vertical scale units in order to bring the curves close together for comparison.

(c) Comment on these two methods of graphic presentation.

140. Line diagram. Lorenz curves. (Data of Table 64.)

On the same axes construct Lorenz curves of the number of establishments and value of products, for all industries and for bread and bakery products.

141. Bar diagram. Geographical comparisons. (Data of Table 62. This table provides a large number of individual exercises.)

For six states indicated by the instructor, construct a bar chart of automobile registrations in 1927.

Note: It is suggested that horizontal bars be employed for these data since this arrangement facilitates the labeling of the bars and the inclusion of figures.

142. Bar diagram. Chronological comparisons. (Data of Table 62. This table provides a large number of individual exercises.)

For any state assigned by the instructor construct a bar chart of automobile registrations, 1917 to 1927 inclusive.

143. Two-bar-unit diagram. Geographical and chronological comparisons. (Data of Table 62. This table provides a large number of individual exercises.)

For six states assigned by the instructor construct a bar chart composed of two-bar units, presenting automobile registrations for each of the states in 1920 and 1927.

Note: See Note to Exercise **141.**

144. Two-bar-unit diagram. Geographical and racial comparisons. (Data of Table 65.)

Construct a bar chart of the white and colored infant death rates per 1000 births for selected cities of 100,000 or more population, 1924. Use a two-bar unit for each city.

Note: See Note to Exercise **141.**

145. Bar diagram. Representation of positive and negative quantities. (Data of Table 66.)

Construct a bar chart to show per cent of change in the amount of payroll, April to May, 1927, for the twelve groups of manufacturing industries. Increases and decreases should be indicated in opposite directions from zero.

Note: See Note to Exercise **141.**

146. Component parts, on percentage basis. Bar and circle.

The chemical composition of white sugar is, carbon, 42.1 per cent; hydrogen, 6.4 per cent; oxygen, 51.5 per cent. (Henry C. Sherman, *Chemistry of Food and Nutrition*, third edition, page 161.)

(a) Construct a bar diagram showing the above data.

(b) Show the same data by means of a "pie" diagram.

(c) Which is the more effective presentation?

147. Component parts, on percentage basis. Bar and circle.

(a) Construct a bar diagram showing the data of the following paragraph:

> "Prunes are grown principally on three kinds of root stocks: the myrobalan, the almond, and the peach. As a result of an inquiry made by the Division of Pomology in 1919 among the nurserymen of the State (California), the popularity of these stocks was found to be as follows, indicated by the percentage of trees propagated on each: 63.3 per cent were grown on myrobalan; 10.4 per cent on almond; 21.2 per cent on peach. In addition, 5.1 per cent were propagated on apricot." (University of California, Agricultural Experiment Station, Bulletin 328, *Prune Growing in California*, by A. H. Hendrickson, page 4.)

(b) Show the same data by means of a "pie" diagram.

(c) Which is the more effective presentation?

148. Component parts, on percentage basis. Bars and circles. (Data of Table 67.)

(a) Construct a series of bars showing the proportions of total income of farmers' families used for food, clothing, rent, and all other expenses, at different income levels.

(b) Show the same data by means of a series of "pie" diagrams.

(c) Which is the more effective presentation?

149. Component parts, on percentage basis. Bars and circles. (Data in *Abstract of the Fourteenth Census of the United States, 1920*, Table 23, page 100. These data provide a large number of individual exercises.)

(a) For any four states designated by the instructor, construct a series of bars, showing the proportions of the total population of the United States, returned as native white of native parentage, native white of foreign parentage, native white of mixed parentage, foreign-born white, negro, and all other.

(b) Show the same data by means of a series of "pie" diagrams.

(c) Which is the more effective presentation?

150. Map; spot, cross-hatched, or shaded. (Data of Table 62.)

Construct a graphic map to show the distribution of automobile registrations in the United States, by states, for 1927.

151. Map; spot, cross-hatched, or shaded. (Data in *Abstract of the Fourteenth Census of the United States, 1920*, Table 22, page 99.)

Construct a graphic map to show the distribution of foreign-born persons in the United States, by states, for 1920.

X

TABLES TO ACCOMPANY EXERCISES

Table 1

Amounts Spent for Meals (from Cash Register Slips), Dodge Hall Cafeteria, Teachers' College, Columbia University, Noon Meal, Monday, December 20, 1926

.40	.44	.45	.56	.35	.31	.50	.37	.55	.54	.57	.37	.44	.30
.20	.34	.20	.45	.51	.55	.15	.38	.40	.30	.34	.55	.39	.22
.24	.27	.30	.21	.44	.19	.43	.45	.35	.20	.05	.49	.25	.42
.31	.60	.44	.41	.40	.43	.30	.35	.45	.54	.47	.24	.41	.35
.17	.29	.30	.34	.29	.45	.39	.36	.25	.35	.54	.30	.54	.40
.40	.34	.41	.44	.36	.53	.22	.45	.26	.26	.25	.29	.42	.35
.35	.41	.34	.33	.40	.38	.38	.35	.25	.57	.35	.35	.46	.44
.22	.29	.29	.30	.34	.36	.55	.39	.35	.60	.22	.40	.30	.32
.33	.41	.66	.45	.32	.45	.29	.45	.26	.25	.49	.59	.48	.71
.40	.16	.39	.36	.49	.19	.40	.36	.24	.35	.46	.25	.39	.24
.51	.41	.33	.16	.66	.38	.55	.41	.60	.22	.35	.51	.27	.50
.16	.34	.51	.54	.47	.40	.49	.45	.46	.20	.24	.41	.41	.29
.64	.45	.67	.35	.33	.49	.09	.34	.47	.56	.35	.50	.54	.37
.47	.40	.34	.52	.21	.25	.30	.24	.37	.45	.29	.44	.46	.30
.22	.58	.42	.42	.33	.37	.43	.36	.35	.41	.47	.33	.40	.40
.55	.37	.19	.56	.40	.58	.35	.36	.42	.27	.44	.50	.24	.36
.31	.44	.35	.43	.39	.31	.49	.45	.35	.33	.26	.35	.58	.29
.65	.46	.29	.35	.21	.56	.25	.41	.26	.24	.22	.34	.29	.17
.30	.35	.40	.50	.26	.45	.43	.33	.27	.21	.29	.56	.59	.46
.45	.44	.45	.39	.31	.34	.53	.49	.35	.40	.30	.27	.45	.51
.39	.60	.45	.22	.41	.38	.35	.25	.05	.50	.59	.24	.37	.36
.23	.51	.52	.40	.44	.49	.55	.38	.17	.36	.41	.42	.40	.43
.31	.37	.32	.29	.48	.55	.43	.35	.32	.55	.24	.17	.39	.30
.37	.44	.26	.25	.25	.37	.40	.45	.41	.38	.29	.29	.24	.28
.29	.75	.44	.34	.37	.32	.52	.31	.34	.17	.56	.53	.44	.17
.46	.28	.20	.33	.44	.40	.30	.38	.36	.30	.22	.30	.49	.39
.68	.35	.39	.49	.31	.38	.25	.34	.20	.29	.40	.42	.54	.22
.35	.29	.34	.41	.52	.52	.36	.45	.36	.23	.48	.41	.46	.30
.54	.12	.27	.57	.35	.31	.34	.40	.58	.58	.65	.37	.36	.40
.45	.25	.49	.09	.41	.28	.43	.35	.36	.25	.40	.40	.46	.46
.34	.35	.21	.35	.39	.44	.45	.42	.48	.49	.64	.50	.44	.65
.26	.46	.45	.41	.25	.50	.35	.38	.14	.29	.27	.34	.26	.28
.69	.29	.36	.21	.40	.31	.34	.43	.50	.37	.30	.40	.41	.40
.49	.16	.61	.31	.39	.47	.54	.31	.26	.20	.31	.37	.40	.32
.23	.46	.39	.61	.27	.24	.29	.40	.36	.55	.26	.43	.25	.24
.31	.54	.30	.45	.46	.36	.36	.25	.20	.30	.25	.57	.55	.17
.46	.44	.29	.44	.52	.29	.41	.50	.35	.20	.39	.39	.74	.30
.23	.29	.49	.29	.39	.44	.39	.26	.19	.31	.64	.45	.37	.50
.31	.37	.25	.45	.41	.35	.25	.36	.42	.36	.22	.54	.39	.32
.55	.42	.42	.21	.35	.26	.25	.59	.45	.49	.36	.48	.28	.41
.47	.51	.31	.16	.49	.19	.40	.35	.54	.54	.65	.24	.30	.20
.33	.15	.25	.47	.37	.66	.38	.29	.20	.29	.51	.39	.49	.50
.46	.28	.63	.64	.45	.38	.34	.34	.34	.40	.44	.48	.28	.31
.73	.55	.50	.46	.40	.43	.29	.40	.39	.27	.40	.31	.39	.48
.48	.44	.27	.35	.19	.80	.35	.45	.20	.56	.29	.42	.29	.45
.55	.20	.36	.15	.43	.52	.32	.25	.46	.34	.46	.19	.33	.37
.46	.39	.12	.44	.35	.39	.47	.35	.44	.56	.44	.27	.50	.20
.31	.44	.41	.47	.46	.37	.36	.40	.31	.60	.65	.46	.37	.50
.28	.36	.19	.31	.60	.41	.42	.35	.48	.49	.35	.24	.22	.34
.31	.33	.46	.27	.45	.35	.40	.45	.44	.47	.44	.35	.51	.32
.39	.43	.29	.46	.24	.44	.36	.35	.15	.40	.42	.27	.44	.17
.46	.34	.25	.35	.49	.25	.49	.41	.56	.35	.35	.48	.30	.31
.42	.48	.44	.41	.60	.39	.45	.40	.70	.05	.26	.30	.40	.19
.52	.30	.56	.40	.34	.29	.38	.34	.31	.36	.51	.42	.58	.31
.45	.44	.45	.25	.28	.42	.41	.32						

Table 2

Amounts Spent for Meals (from Cash Register Slips), Dodge Hall Cafeteria, Teachers' College, Columbia University, Evening Meal, Thursday, December 16, 1926

.36	.83	.50	.40	.51	.76	.60	.40	.72	.54	.46	.38	.50	.45
.33	.30	.54	.55	.53	.80	.63	.60	.56	.55	.44	.47	.52	.71
.60	.42	.49	.69	.66	.45	.46	.50	.80	.65	.61	.84	.43	.73
.80	.69	.70	.39	.46	.54	.52	.56	.35	.69	.74	.30	.68	.50
.25	.64	.50	.45	.79	.45	.25	.61	.54	.40	.78	.35	.44	.44
.62	.70	.46	.20	.74	.39	.60	.55	.75	.56	.57	.77	.59	.35
.37	.59	.75	.45	.41	.54	.59	.17	.62	.70	.55	.22	.45	.49
.71	.46	.55	.65	.56	.50	.35	.78	.29	.63	.50	.29	.72	.72
.55	.65	.51	.37	.54	.49	.51	.55	.53	.56	.75	.45	.40	.45
.60	.51	.65	.60	.45	.34	.47	.86	.41	.50	.33	.70	.45	.50
.44	.45	.79	.65	.50	.43	.70	.68	.75	.55	.97	.41	.69	.32
.47	.44	.36	.40	.42	.71	.30	.37	.44	.64	.60	.71	.50	.62
.75	.65	.61	.62	.43	.22	.73	.57	.50	.69	.56	.65	.91	.70
.27	.70	.58	.70	.68	.82	.34	.60	.41	.50	.48	.31	.65	.60
.70	.35	.55	.47	.60	.51	.60	.75	.65	.64	.16	.51	.51	.46
.45	.64	.66	.62	.59	.57	.54	.59	.44	.51	.65	.65	.40	.80
.76	.55	.63	.45	1.20	.75	.48	.49	.53	.60	.40	.55	.58	.37
.66	.72	.33	.19	.60	.30	.55	.67	.60	.47	.60	.66	.56	.43
.56	.65	.59	.52	.50	.36	.46	.55	.70	.52	.50	.55	.66	.48
.52	.70	.51	.46	.58	.34	.90	.72	.59	.43	.59	.65	.50	.57
.45	.25	.54	.60	.62	.80	.50	.51	.65	.81	.57	.61	.67	.44
.52	.50	.43	.53	.76	.40	.45	.69	.51	.53	.65	.51	.45	.53
.61	.78	.21	.59	.54	.66	.55	.77	.41	.61	.80	.70	.27	.60
.40	.40	.66	.70	.67	.55	.25	.57	.53	.29	.59	.77	.50	.36
.75	.26	.58	.16	.60	.35	.25	.40	.55	.48	.56	.60	.36	.51
.65	.62	.67	.76	.68	.55	.56	.69	.58	.63	.42	.48	.71	.65
.52	.43	.61	.50	.67	.36	.60	.27	.52	.55	.30	.45	.92	.85
.65	.50	.31	.55	.52	.52	.42	.59	.40	.64	.45	.70	.60	.80
.49	.65	.54	.46	.58	.40	.45	.40	.85	.63	.56	.59	.39	.50
.52	.77	.39	.75	.65	.70	.76	.44	.31	.55	.46	.42	.63	.45
.40	.56	.45	.47	.75	.37	.57	.72	.42	.59	.55	.67	.86	.49
.62	.50	.51	.36	.49	.36	.63	.60	.54	.44	.57	.60	.60	.33
.43	.47	.55	.46	.20	.50	.61	.24	.58	.58	.47	.92	.69	.61
.60	.36	.40	.62	.74	.61	.48	.79	.70	.30	.88	.65	.45	.68
.56	.42	.54	.55	.65	.50	.55	.75	.60	.78	.46	.69	.47	.34
.33	.62	.45	.74	.57	.56	.44	.40	.43	.47	.57	.47	.60	.80
.70	.70	.50	.66	.45	.80	.60	.41	.39	.55	.80	.65	.50	.52
.60	.66	.28	.50	.29	.85	.49	.64	.35	.49	.45	.55	.88	.22
.80	.54	.60	.95	.75	.90	.56	.45	.63	.30	.57	.70	.27	.35
.90	.59	.13	.40	.39	.55	.66	.37	.66	.70	.38	.74	.75	.50
.58	.40	.50	.57	.54	.72	.55	.54	.65	.57	.80	.70	.65	.64
.62	.62	.57	.45	.56	.40	.65	.29	.50	.70	.60	.60	.45	.70
.69	.53	.47	.60	.79	.34	.60	.64	.76	.60	.74	.74	.22	.85
.56	.29	.25	.53	.27	.50	.57	.61	.37	.57	.55	.45	.50	.39
.42	.54	.54	.42	.56	.53	.66	.45	.66	.55	.23	.55	.62	.16
.15	.70	.58	.50	.58	.60	.50	.68	.52	.59	.50	.69	.40	.34
.88	.50	.35	.36	.51	.72	.89	.29	.41	.78	.77	.45	.63	.43
.58	.51	.55	.87	.61	.50	.39	.30	.48	.85	.41	.49	.55	.26
.54	.42	.46	.75	.82	.43	.35	.39	.51	.84	.43	.64	.32	.27
.40	.55	.35	.50	.67	.39	.58	.42	.50	.55	.54	.61	.69	.75
.65	.21	.66	.74	.65	.25	.79	.36	.40	.30	.36	.49	.35	

TABLE 3

PAYROLL OF A SHOE MANUFACTURING COMPANY

(This concern is non-union, wages are paid on a piece basis, and the product consists of shoes for children, growing girls, and old ladies. The payroll was for the week ending January 23, 1926, a period during which the factory was operating full time.)

DEPARTMENT 1. LASTING ROOM

(126 employees, total payroll $3785.75)

Employee number	Wage	Employee number	Wage	Employee number	Wage	Employee number	Wage
1000	$35.35	1032	$23.35	1064	$40.95	1096	$19.30
1001	35.10	1033	24.65	1065	34.65	1097	18.60
1002	39.00	1034	25.15	1066	28.90	1098	22.90
1003	27.50	1035	25.10	1067	40.75	1099	15.20
1004	27.00	1036	40.20	1068	36.70	1100	15.20
1005	39.20	1037	32.20	1069	21.20	1101	19.25
1006	3.45	1038	35.35	1070	41.60	1102	21.45
1007	27.30	1039	41.45	1071	26.85	1103	17.95
1008	18.45	1040	36.90	1072	29.75	1104	25.10
1009	37.10	1041	37.20	1073	46.65	1105	27.95
1010	38.10	1042	34.85	1074	36.90	1106	28.15
1011	26.95	1043	38.65	1075	29.10	1107	24.85
1012	37.25	1044	37.45	1076	34.35	1108	36.05
1013	27.10	1045	37.00	1077	27.80	1109	26.65
1014	26.90	1046	40.60	1078	28.90	1110	22.00
1015	28.15	1047	39.65	1079	31.45	1111	19.25
1016	26.25	1048	37.90	1080	29.10	1112	27.00
1017	25.80	1049	36.40	1081	34.65	1113	19.00
1018	26.25	1050	39.55	1082	23.10	1114	18.10
1019	30.85	1051	34.25	1083	34.10	1115	19.00
1020	31.75	1052	40.15	1084	36.30	1116	31.80
1021	31.35	1053	39.20	1085	34.00	1117	22.90
1022	37.00	1054	38.25	1086	35.25	1118	20.50
1023	37.70	1055	43.40	1087	33.60	1119	25.60
1024	31.05	1056	35.05	1088	37.60	1120	26.45
1025	28.05	1057	38.50	1089	32.35	1121	25.80
1026	21.25	1058	36.95	1090	29.20	1122	20.35
1027	13.05	1059	43.15	1091	30.40	1123	34.05
1028	16.20	1060	27.05	1092	32.35	1124	38.00
1029	15.85	1061	37.15	1093	19.10	1125	35.20
1030	28.35	1062	32.75	1094	18.95		
1031	27.25	1063	37.90	1095	16.35		

DEPARTMENT 2. CUTTING ROOM

(215 employees, total payroll $4283.90)

Employee number	Wage	Employee number	Wage	Employee number	Wage	Employee number	Wage
2000	$25.30	2011	$19.25	2022	$11.25	2033	$13.00
2001	23.10	2012	20.90	2023	25.45	2034	9.60
2002	23.75	2013	14.00	2024	17.60	2035	9.70
2003	17.05	2014	9.95	2025	14.90	2036	18.35
2004	8.80	2015	20.80	2026	14.40	2037	9.45
2005	19.25	2016	7.85	2027	27.90	2038	6.50
2006	10.85	2017	10.00	2028	10.55	2039	9.95
2007	19.25	2018	31.80	2029	21.45	2040	3.95
2008	22.65	2019	14.25	2030	13.65	2041	13.55
2009	20.90	2020	11.45	2031	9.00	2042	9.00
2010	17.60	2021	27.30	2032	18.15	2043	18.10

Table continued on next page

TABLE 3 — *continued*

DEPARTMENT 2 (*continued*)

Employee number	Wage	Employee number	Wage	Employee number	Wage	Employee number	Wage
2044	$10.35	2087	$20.00	2130	$29.55	2173	$ 3.15
2045	14.65	2088	26.50	2131	26.40	2174	8.65
2046	20.90	2089	18.55	2132	33.25	2175	18.05
2047	9.00	2090	23.25	2133	25.15	2176	19.75
2048	20.75	2091	33.00	2134	22.90	2177	20.65
2049	12.65	2092	28.05	2135	13.00	2178	19.15
2050	13.75	2093	27.05	2136	34.65	2179	22.00
2051	18.65	2094	34.65	2137	19.25	2180	33.00
2052	21.00	2095	33.00	2138	31.50	2181	20.45
2053	18.25	2096	34.65	2139	17.30	2182	23.10
2054	19.25	2097	35.35	2140	17.05	2183	21.85
2055	11.00	2098	25.55	2141	25.25	2184	13.75
2056	13.65	2099	34.65	2142	40.75	2185	24.60
2057	6.95	2100	14.30	2143	30.85	2186	17.30
2058	14.75	2101	35.55	2144	25.75	2187	22.75
2059	10.20	2102	28.05	2145	25.80	2188	20.45
2060	21.70	2103	22.75	2146	36.40	2189	34.75
2061	14.95	2104	31.95	2147	33.00	2190	30.00
2062	10.25	2105	37.95	2148	30.25	2191	25.70
2063	26.90	2106	20.40	2149	13.85	2192	13.05
2064	12.15	2107	17.00	2150	8.05	2193	25.60
2065	21.75	2108	30.10	2151	6.40	2194	21.00
2066	11.45	2109	34.65	2152	20.00	2195	15.90
2067	13.20	2110	35.35	2153	5.00	2196	14.60
2068	13.45	2111	20.00	2154	9.00	2197	5.30
2069	12.25	2112	19.80	2155	11.00	2198	22.25
2070	14.40	2113	27.30	2156	10.90	2199	23.60
2071	15.95	2114	22.40	2157	7.50	2200	29.05
2072	7.50	2115	33.00	2158	5.40	2201	5.85
2073	5.95	2116	19.50	2159	11.85	2202	5.95
2074	16.65	2117	33.00	2160	7.05	2203	13.80
2075	18.50	2118	32.70	2161	7.50	2204	27.50
2076	3.50	2119	26.65	2162	13.25	2205	19.25
2077	7.50	2120	29.95	2163	29.10	2206	28.60
2078	7.50	2121	23.45	2164	22.50	2207	18.20
2079	13.20	2122	17.25	2165	27.20	2208	22.55
2080	20.75	2123	17.45	2166	25.65	2209	17.30
2081	25.65	2124	30.25	2167	34.10	2210	33.40
2082	21.95	2125	20.50	2168	27.90	2211	12.50
2083	35.65	2126	30.25	2169	28.45	2212	32.60
2084	19.25	2127	29.50	2170	30.05	2213	23.80
2085	11.10	2128	25.00	2171	12.55	2214	20.65
2086	20.15	2129	26.65	2172	12.85		

TABLE 3 — *continued*

DEPARTMENT 3. STITCHING ROOM
(295 employees, total payroll $5176.25)

Employee number	Wage	Employee number	Wage	Employee number	Wage	Employee number	Wage
3000	$16.80	3053	$15.40	3106	$ 8.80	3159	$ 6.65
3001	8.25	3054	15.40	3107	11.00	3160	13.75
3002	15.40	3055	16.10	3108	10.45	3161	10.40
3003	23.05	3056	20.35	3109	11.00	3162	18.75
3004	14.25	3057	27.45	3110	17.10	3163	13.75
3005	16.65	3058	15.20	3111	10.65	3164	24.75
3006	25.00	3059	23.65	3112	16.50	3165	9.90
3007	24.05	3060	16.50	3113	17.60	3166	18.70
3008	18.15	3061	19.45	3114	13.75	3167	23.40
3009	21.30	3062	18.70	3115	10.80	3168	19.00
3010	23.50	3063	22.70	3116	19.40	3169	13.75
3011	11.00	3064	18.90	3117	7.05	3170	13.75
3012	19.40	3065	23.30	3118	15.55	3171	15.95
3013	16.60	3066	16.50	3119	12.10	3172	22.70
3014	14.35	3067	7.80	3120	17.60	3173	10.80
3015	10.60	3068	27.65	3121	13.80	3174	4.40
3016	26.45	3069	26.75	3122	10.15	3175	7.90
3017	25.10	3070	18.25	3123	8.30	3176	13.75
3018	29.05	3071	17.85	3124	8.80	3177	11.00
3019	15.25	3072	11.00	3125	24.65	3178	9.90
3020	25.45	3073	14.60	3126	15.40	3179	10.90
3021	16.50	3074	23.80	3127	14.10	3180	12.10
3022	17.60	3075	32.20	3128	18.15	3181	19.55
3023	8.90	3076	29.25	3129	15.40	3182	11.00
3024	26.60	3077	19.90	3130	13.25	3183	10.90
3025	25.85	3078	20.15	3131	16.50	3184	17.85
3026	28.80	3079	22.85	3132	19.80	3185	22.75
3027	17.65	3080	17.40	3133	25.75	3186	17.60
3028	26.35	3081	11.00	3134	17.45	3187	21.60
3029	16.70	3082	22.90	3135	16.40	3188	11.00
3030	20.60	3083	27.00	3136	19.25	3189	16.80
3031	37.10	3084	17.05	3137	23.45	3190	9.10
3032	19.55	3085	9.70	3138	18.30	3191	11.00
3033	18.20	3086	13.75	3139	23.05	3192	8.30
3034	25.35	3087	15.95	3140	13.75	3193	18.20
3035	24.75	3088	23.05	3141	15.70	3194	13.95
3036	22.35	3089	20.30	3142	34.65	3195	8.80
3037	24.45	3090	19.25	3143	16.60	3196	10.00
3038	19.80	3091	21.05	3144	29.90	3197	9.15
3039	22.65	3092	19.75	3145	19.25	3198	8.45
3040	7.75	3093	22.85	3146	19.25	3199	16.20
3041	17.95	3094	21.50	3147	15.80	3200	8.20
3042	28.90	3095	15.40	3148	15.00	3201	14.65
3043	12.60	3096	24.70	3149	27.30	3202	19.80
3044	19.25	3097	14.10	3150	10.85	3203	9.30
3045	16.30	3098	21.75	3151	8.55	3204	25.10
3046	20.15	3099	20.30	3152	11.25	3205	22.45
3047	20.45	3100	20.35	3153	16.50	3206	26.50
3048	13.50	3101	2.95	3154	25.95	3207	23.55
3049	4.40	3102	16.00	3155	12.60	3208	21.25
3050	14.10	3103	10.45	3156	18.50	3209	23.00
3051	27.50	3104	15.45	3157	15.40	3210	27.50
3052	16.00	3105	11.00	3158	1.65	3211	15.40

Table continued on next page.

TABLE 3 — *continued*

DEPARTMENT 3 (*continued*)

Employee number	Wage	Employee number	Wage	Employee number	Wage	Employee number	Wage
3212	$21.40	3233	$ 5.55	3254	$17.60	3275	$ 7.90
3213	20.80	3234	2.45	3255	21.25	3276	20.50
3214	25.80	3235	18.25	3256	20.95	3277	5.10
3215	27.15	3236	21.15	3257	22.40	3278	25.65
3216	6.55	3237	10.50	3258	15.50	3279	8.80
3217	22.60	3238	17.60	3259	1.20	3280	15.40
3218	22.80	3239	13.85	3260	6.55	3281	18.30
3219	16.70	3240	9.70	3261	27.45	3282	19.15
3220	23.20	3241	8.80	3262	22.80	3283	11.15
3221	23.75	3242	15.40	3263	27.60	3284	12.10
3222	19.55	3243	36.10	3264	26.85	3285	22.70
3223	23.45	3244	8.80	3265	18.65	3286	15.45
3224	21.55	3245	15.40	3266	17.30	3287	17.65
3225	26.60	3246	14.70	3267	19.15	3288	14.30
3226	19.45	3247	23.95	3268	29.10	3289	15.40
3227	22.00	3248	4.05	3269	26.35	3290	25.10
3228	14.00	3249	19.75	3270	15.40	3291	22.00
3229	28.70	3250	20.10	3271	14.20	3292	25.00
3230	10.40	3251	21.85	3272	5.95	3293	25.00
3231	20.25	3252	17.45	3273	11.30	3294	30.25
3232	3.95	3253	21.70	3274	14.60		

DEPARTMENT 4. STOCK FITTING ROOM

(65 employees, total payroll $1698.70)

Employee number	Wage	Employee number	Wage	Employee number	Wage	Employee number	Wage
4000	$43.65	4017	$37.50	4034	$13.75	4051	$16.50
4001	35.15	4018	38.80	4035	24.75	4052	16.50
4002	42.80	4019	32.55	4036	20.35	4053	27.50
4003	32.70	4020	30.75	4037	34.65	4054	26.40
4004	36.10	4021	30.20	4038	19.25	4055	21.65
4005	35.80	4022	28.10	4039	23.65	4056	23.30
4006	16.30	4023	12.50	4040	31.35	4057	26.40
4007	12.40	4024	29.90	4041	19.25	4058	26.40
4008	32.10	4025	21.05	4042	18.15	4059	22.55
4009	28.20	4026	36.00	4043	22.00	4060	23.60
4010	37.35	4027	20.35	4044	16.50	4061	20.35
4011	22.90	4028	24.75	4045	18.15	4062	24.75
4012	25.40	4029	13.75	4046	19.25	4063	13.90
4013	25.10	4030	8.20	4047	27.95	4064	35.95
4014	43.15	4031	28.60	4048	24.95		
4015	28.40	4032	31.90	4049	34.20		
4016	28.25	4033	19.25	4050	34.90		

TABLE 3 — *continued*

DEPARTMENT 5. BOTTOMING ROOM

(92 employees, total payroll $2862.20)

Employee number	Wage	Employee number	Wage	Employee number	Wage	Employee number	Wage
5000	$29.90	5023	$25.20	5046	$33.60	5069	$46.55
5001	34.05	5024	35.15	5047	32.40	5070	49.40
5002	31.40	5025	35.15	5048	21.60	5071	38.30
5003	35.15	5026	35.90	5049	24.75	5072	43.10
5004	33.75	5027	19.25	5050	19.25	5073	39.45
5005	30.30	5028	27.50	5051	16.50	5074	41.70
5006	30.05	5029	20.60	5052	22.00	5075	33.00
5007	30.55	5030	31.15	5053	18.45	5076	32.30
5008	34.50	5031	30.80	5054	16.45	5077	30.55
5009	36.45	5032	37.45	5055	17.50	5078	42.55
5010	30.15	5033	37.95	5056	19.25	5079	38.85
5011	46.15	5034	37.10	5057	30.25	5080	24.75
5012	35.85	5035	38.85	5058	39.95	5081	22.00
5013	32.05	5036	38.45	5059	45.50	5082	24.75
5014	24.40	5037	37.95	5060	28.20	5083	31.90
5015	35.65	5038	30.60	5061	33.55	5084	32.30
5016	29.60	5039	36.45	5062	35.15	5085	19.80
5017	42.00	5040	24.75	5063	26.80	5086	15.00
5018	24.25	5041	41.40	5064	40.05	5087	10.10
5019	20.60	5042	43.40	5065	38.00	5088	20.90
5020	21.10	5043	42.25	5066	50.35	5089	15.80
5021	34.35	5044	19.25	5067	36.45	5090	16.50
5022	22.20	5045	37.20	5068	34.95	5091	23.50

DEPARTMENT 6. FINISHING ROOM

(61 employees, total payroll $1645.05)

Employee number	Wage	Employee number	Wage	Employee number	Wage	Employee number	Wage
6000	$32.30	6016	$20.25	6032	$28.85	6048	$28.75
6001	31.35	6017	36.00	6033	24.95	6049	25.75
6002	22.00	6018	25.60	6034	17.30	6050	16.80
6003	30.05	6019	36.55	6035	17.80	6051	22.15
6004	20.65	6020	23.25	6036	17.45	6052	26.30
6005	32.85	6021	32.20	6037	13.75	6053	20.40
6006	22.95	6022	4.10	6038	16.30	6054	16.50
6007	33.15	6023	33.60	6039	29.10	6055	30.30
6008	25.80	6024	33.20	6040	33.35	6056	29.15
6009	41.65	6025	35.10	6041	21.80	6057	27.45
6010	31.45	6026	28.15	6042	27.35	6058	29.50
6011	23.90	6027	34.80	6043	24.30	6059	25.35
6012	40.50	6028	23.65	6044	30.75	6060	29.90
6013	29.60	6029	35.85	6045	23.65		
6014	27.10	6030	31.25	6046	29.65		
6015	21.85	6031	31.20	6047	28.50		

TABLE 3 — *continued*

DEPARTMENT 7. PACKING ROOM

(118 employees, total payroll $2058.00)

Employee number	Wage	Employee number	Wage	Employee number	Wage	Employee number	Wage
7000	$29.05	7030	$28.80	7060	$23.35	7090	$22.00
7001	14.40	7031	21.60	7061	20.80	7091	12.90
7002	17.05	7032	19.00	7062	23.65	7092	11.00
7003	14.20	7033	19.00	7063	15.30	7093	25.10
7004	15.05	7034	13.50	7064	19.45	7094	12.75
7005	13.00	7035	13.10	7065	11.60	7095	20.25
7006	12.00	7036	7.60	7066	14.75	7096	22.35
7007	22.55	7037	26.35	7067	21.65	7097	23.25
7008	15.00	7038	17.15	7068	22.30	7098	10.95
7009	20.15	7039	11.40	7069	18.20	7099	22.65
7010	15.00	7040	17.30	7070	12.20	7100	24.55
7011	10.90	7041	16.30	7071	11.00	7101	15.05
7012	22.00	7042	19.55	7072	15.05	7102	10.30
7013	18.05	7043	13.45	7073	16.90	7103	14.30
7014	19.45	7044	17.25	7074	20.15	7104	17.85
7015	18.15	7045	17.35	7075	9.80	7105	19.20
7016	18.50	7046	16.40	7076	13.70	7106	18.70
7017	20.25	7047	16.10	7077	18.05	7107	17.40
7018	20.25	7048	9.15	7078	10.00	7108	19.45
7019	18.00	7049	16.40	7079	13.45	7109	18.70
7020	19.55	7050	17.80	7080	9.70	7110	18.75
7021	20.55	7051	16.35	7081	15.35	7111	16.50
7022	19.60	7052	17.25	7082	22.95	7112	13.40
7023	24.35	7053	19.00	7083	8.70	7113	15.35
7024	3.15	7054	22.00	7084	21.10	7114	30.25
7025	20.60	7055	28.65	7085	18.80	7115	11.00
7026	19.45	7056	11.55	7086	3.05	7116	26.85
7027	18.05	7057	25.70	7087	12.50	7117	32.15
7028	15.00	7058	13.35	7088	18.70		
7029	15.95	7059	22.80	7089	12.40		

TABLE 4

NUMBER OF DAYS WORKED BY MEN IN BITUMINOUS COAL MINES IN THE UNITED STATES, 1921

(United States Geological Survey, *Coal in 1922*, by F. G. Tryon and Sydney A. Hale, page 498.)

Days of mine operation	Men employed
Less than 20	19,263
20 to 39	27,280
40 to 59	27,746
60 to 79	36,146
80 to 99	49,153
100 to 119	55,016
120 to 139	81,533
140 to 159	75,732
160 to 179	68,432
180 to 199	63,446
200 to 219	55,215
220 to 239	33,940
240 to 259	28,615
260 to 279	16,774
280 to 299	16,701
300 or more	8,461
Total	663,453

TABLE 5

EARNINGS OF 1600 LABORERS IN BLAST FURNACES (16-DAY PAY PERIOD), UNITED STATES, 1926

(United States Bureau of Labor Statistics, Bulletin 442, *Wages and Hours of Labor in the Iron and Steel Industry, 1907 to 1926*, page 44.)

Earnings	Number of laborers
Under $5	41
$5 and under 10	57
10 and under 15	58
15 and under 20	68
20 and under 25	85
25 and under 30	80
30 and under 35	114
35 and under 40	163
40 and under 45	158
45 and under 50	124
50 and under 55	163
55 and under 60	168
60 and under 65	187
65 and under 70	83
70 and under 75	35
75 and under 80	13
80 and under 85	2
85 and under 90	..
90 and under 95	1
Total	1600

Table 6

Earnings per Half Month of Brakemen and Laborers in West Virginia Bituminous Coal Mines, 1924

(United States Bureau of Labor Statistics, Bulletin 416, *Hours and Earnings in Anthracite and Bituminous Coal Mining, 1922 and 1924*, pages 66 and 67.)

Earnings per half month	Number of brakemen	Number of laborers
Under $5	32	83
$5 and under 10	34	70
10 and under 15	36	80
15 and under 20	39	74
20 and under 25	67	92
25 and under 30	90	129
30 and under 35	67	107
35 and under 40	107	191
40 and under 45	137	221
45 and under 50	142	180
50 and under 55	139	111
55 and under 60	85	78
60 and under 65	57	59
65 and under 70	39	49
70 and under 75	36	49
75 and under 80	24	18
80 and under 90	29	58
90 and under 100	24	14
100 and under 110	3	4
110 and under 120	2	3
120 and under 140	..	..
140 and under 160	..	1
160 and under 180	..	1
Total	1189	1672

TABLE 7

AVERAGE ANNUAL NUMBER OF MALE DEATHS FROM HEART DISEASES PER 100,000 POPULATION AT EACH AGE PERIOD, IN NEW YORK CITY, 1915–24

(New York Tuberculosis and Health Association, *Statistics of Mortality from Heart Diseases, New York City*, page 3.)

Age period (years)	Deaths per 100,000 population
Under 5	20
5– 9	30
10–14	38
15–19	47
20–24	41
25–29	42
30–34	61
35–39	100
40–44	172
45–49	284
50–54	474
55–59	804
60–64	1205
65–69	1969
70–74	2981
75–79	4230
80–84	6264
85 and over	8646

TABLE 8

INDIVIDUAL RETURNS UNDER $25,000, FEDERAL INCOME TAX, 1925

(Adapted from Treasury Department, *Statistics of Income, 1925*, Table 3, page 90.)

Income classes	Number
Under $ 1000	98,178
$ 1000 to 2000	1,071,992
2000 to 3000	842,528
3000 to 4000	747,287
4000 to 5000	580,396
5000 to 6000	174,421
6000 to 7000	121,496
7000 to 8000	89,447
8000 to 9000	65,680
9000 to 10000	52,608
10000 to 11000	39,403
11000 to 12000	31,978
12000 to 13000	26,764
13000 to 14000	22,240
14000 to 15000	18,786
15000 to 20000	62,676
20000 to 25000	34,932

Table 9

Distribution by Age Periods of the Total Population of the United States, 1880 and 1920, and of the Foreign-born White Population of 1920 — Number and Per cent of Total

(*Abstract of the 14th Census of the United States, 1920*, pages 135, 141, 142.)

Age period (years)	Total population				Foreign-born white, 1920	
	1880		1920			
	Number	Per cent	Number	Per cent	Number	Per cent
Under 5	6,914,516	13.8	11,573,230	10.9	44,984	0.3
5– 9	6,479,660	12.9	11,398,075	10.8	169,884	1.2
10–14	5,715,186	11.4	10,641,137	10.1	331,362	2.4
15–19	5,011,415	10.0	9,430,556	8.9	527,942	3.9
20–24	5,087,772	10.1	9,277,021	8.8	926,844	6.8
25–29	4,080,621	8.1	9,086,491	8.6	1,454,363	10.6
30–34	3,368,943	6.7	8,071,193	7.6	1,651,475	12.0
35–39	3,000,419	6.0	7,775,281	7.4	1,737,805	12.7
40–44	2,468,811	4.9	6,345,557	6.0	1,428,099	10.4
45–49	2,089,445	4.2	5,763,620	5.5	1,299,675	9.5
50–54	1,839,883	3.7	4,734,873	4.5	1,167,377	8.5
55–59	1,271,434	2.5	3,549,124	3.4	908,722	6.6
60–64	1,104,219	2.2	2,982,548	2.8	715,731	5.2
65–69	725,876	1.4	2,068,475	2.0	519,226	3.8
70–74	495,442	1.0	1,395,036	1.3	381,325	2.8
75–79	281,065	.6	856,560	.8	246,487	1.8
80–84	146,362	.3	402,779	.4	118,935	.9
85–89	49,835	.1	156,539	.1	47,473	.3
90–94	16,100	(*)	39,980	(*)	11,717	.1
95–99	4,763	(*)	9,579	(*)	2,579	(*)
100 and over	4,016	(*)	4,267	(*)	485	(*)
Total	50,155,783	100.0	105,561,921	100.0	13,692,490	100.0

* Less than one-tenth of one per cent.

TABLE 10

NUMBER OF DEATHS, BOTH SEXES, FROM ALL CAUSES, PER 1000 POPULATION AT EACH AGE PERIOD, IN NEW YORK CITY, 1923

(New York State Department of Health, *Forty-Fourth Annual Report*, Vol. II, page 26.)

Age period (years)	Deaths per 1000 population
Under 5	20.4
5– 9	2.4
10–14	1.9
15–19	3.2
20–24	3.7
25–29	4.1
30–34	5.0
35–39	6.6
40–44	9.5
45–49	13.0
50–54	18.7
55–59	28.3
60–64	41.1
65–69	62.7
70–74	88.4
75–79	115.8
80–84	172.9
85 and over	232.1

TABLE 11

ESTIMATED PRICE OF EGGS PER DOZEN RECEIVED BY PRODUCERS IN THE UNITED STATES AND RECEIPTS AT FIVE PRINCIPAL MARKETS, BY MONTHS, 1926

(United States Department of Agriculture, *Yearbook of Agriculture, 1926*, pages 1164 and 1168.)

Month	Price per dozen (cents)	Receipts at five markets (thousand cases)
January	36.3	906
February	28.9	1070
March	24.1	1741
April	24.8	2086
May	25.2	2261
June	25.7	2015
July	25.7	1386
August	26.4	1081
September	31.5	933
October	36.8	699
November	44.9	581
December	47.6	752

TABLE 12

POPULATION, DEATHS FROM TUBERCULOSIS (ALL FORMS), AND RATES PER 100,000 POPULATION FOR CITIES OF 25,000 TO 50,000 INHABITANTS, NEW YORK STATE, 1926

(New York State Department of Health, supplement to *Monthly Vital Statistics Review*, March, 1927, Tables 7 and 10.)

City	Estimated population July 1, 1926	Number of deaths	Death rate per 100,000 population
Amsterdam	35,607	26	73.0
Auburn	34,286	27	78.7
Elmira	47,622	20	42.0
Jamestown	44,313	23	51.9
Kingston	28,381	44	155.0
Newburgh	30,430	33	108.4
New Rochelle	45,824	11	24.0
Poughkeepsie	35,804	32	89.4
Rome	28,560	31	108.5
Watertown	33,146	27	81.5
White Plains	28,707	14	48.8
Total	392,680	288	73.3

TABLE 13

ANNUAL SALARIES OF VISITORS AND VISITORS-IN-TRAINING in 169 FAMILY WELFARE ORGANIZATIONS, FEBRUARY, 1927

(Courtesy, Russell Sage Foundation, Department of Statistics.)

Annual salary	Number of persons
$600– 799	22
800– 999	88
1000–1199	121
1200–1399	390
1400–1599	215
1600–1799	99
1800–1999	86
2000–2199	18
2200–2399	1
Total	1040

TABLE 14

EARNINGS IN ONE WEEK IN 1926 OF WOMEN WORKING AS HAND SEWERS ON MEN'S COATS IN ST. LOUIS, CINCINNATI, and CLEVELAND

(United States Bureau of Labor Statistics, Bulletin 435, *Wages and Hours of Labor in the Men's Clothing Industry 1911 to 1926*, page 59.)

Weekly earnings	Number of employees		
	Cincinnati	Cleveland	St. Louis
Under $2	1	1	..
$2 and under 4	1	2	2
4 and under 6	2	1	2
6 and under 8	2	1	4
8 and under 10	6	3	11
10 and under 12	14	4	13
12 and under 14	27	10	28
14 and under 16	15	12	28
16 and under 18	19	14	29
18 and under 20	15	22	21
20 and under 22	9	28	13
22 and under 24	7	33	6
24 and under 26	7	26	2
26 and under 28	4	14	2
28 and under 30	2	18	4
30 and under 32	2	13	1
32 and under 34	3	3	1
34 and under 36	1	4	1
36 and under 38	3	..	2
38 and under 40	..	..	1
Total	140	209	171

TABLE 15

DISTRIBUTION OF EARNINGS, FOR SELECTED DEPARTMENTS AND FOR ALL WAGE EARNERS OF A SHOE MANUFACTURING COMPANY

(From ungrouped data of Table 3.)

Weekly earnings	Number employees, Dept. 3	Number employees, Dept. 7	Number employees, Depts. 1–7 inclusive
Under $2.50	3	..	3
$2.50– 4.99	5	2	12
5.00– 7.49	7	..	17
7.50– 9.99	24	5	48
10.00–12.49	30	13	61
12.50–14.99	27	15	76
15.00–17.49	49	24	103
17.50–19.99	46	25	118
20.00–22.49	30	16	99
22.50–24.99	32	9	84
25.00–27.49	26	4	85
27.50–29.99	11	3	61
30.00–32.49	2	2	53
32.50–34.99	1	..	47
35.00–37.49	2	..	50
37.50–39.99	..	..	26
40.00–42.49	..	..	15
42.50–44.99	..	..	8
45.00–47.49	..	..	4
47.50–49.99	..	..	1
50.00–52.49	..	..	1
Total	295	118	972

TABLE 16

MONTHLY SALARIES OF "STAFF" IN SOCIAL WORK ORGANIZATIONS IN 1925

(Courtesy, Russell Sage Foundation, Department of Statistics.)

Monthly salary	Number of persons
$40– 49.99	2
50– 59.99	2
60– 69.99	15
70– 79.99	17
80– 89.99	100
90– 99.99	97
100–109.99	242
110–119.99	160
120–129.99	214
130–139.99	192
140–149.99	102
150–159.99	117
160–169.99	43
170–179.99	144
180–189.99	9
190–199.99	4
200–209.99	3
210–219.99	1
220–229.99	..
230–239.99	1
Total	1465

TABLE 17

AMOUNTS SPENT FOR MEALS FOR SIX DAYS IN DECEMBER, 1926, DODGE HALL CAFETERIA, TEACHERS' COLLEGE, COLUMBIA UNIVERSITY

Amount	Noon meals						Evening meals					Breakfast 6 week days	Noon meals 6 week days	Evening meals 6 week days
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Monday	Tuesday	Wednesday	Thursday	Friday			
$.03– .07	3	1	2	3	6	1	..	1	1	..	..	6	16	2
.08– .12	4	8	4	7	6	6	3	..	2	..	2	214	35	8
.13– .17	18	10	21	14	22	14	7	4	4	6	4	289	99	30
.18– .22	42	29	43	35	38	25	9	10	17	9	7	417	212	63
.23– .27	73	77	83	79	68	53	12	17	22	17	24	354	433	105
.28– .32	102	108	117	108	91	75	27	42	43	22	31	231	601	195
.33– .37	134	122	137	137	97	125	55	63	43	43	52	138	752	296
.38– .42	124	113	125	95	109	125	70	100	80	54	59	69	691	427
.43– .47	115	109	118	109	99	112	98	89	71	79	72	33	662	484
.48– .52	64	68	77	64	77	106	102	126	91	88	70	30	456	525
.53– .57	44	53	60	47	66	67	128	104	90	99	90	10	337	571
.58– .62	19	23	24	40	31	38	96	88	75	90	98	5	175	485
.63– .67	14	13	22	15	23	26	70	66	73	67	57	2	113	372
.68– .72	4	8	4	6	7	13	43	44	49	55	44	..	42	254
.73– .77	3	1	2	3	2	2	26	27	35	36	28	..	13	172
.78– .82	1	2	2	1	1	4	13	8	24	25	17	..	11	105
.83– .87	..	1	..	..	1	1	3	4	25	10	5	..	3	63
.88– .92	..	..	..	..	..	..	5	1	18	10	2	..	..	41
.93– .97	..	..	..	..	..	..	1	2	5	2	1	..	..	16
.98–1.02	..	..	..	..	..	..	3	2	2	..	1	..	..	8
1.03–1.07	..	..	..	..	..	..	..	1	..	..	..	..	..	1
1.08–1.12	..	..	..	..	..	..	..	..	1	..	..	..	..	1
1.13–1.17	..	..	..	..	..	..	..	..	1	..	1	..	..	2
1.18–1.22	..	..	..	..	..	..	..	..	..	1	1	..	..	2
Total	764	746	841	763	744	793	771	799	772	713	666	1798	4651	4228

TABLE 18

WEEKLY EARNINGS OF WOMEN IN THE TEXTILE INDUSTRY, IN FIVE-AND-TEN-CENT STORES, AND IN THE MEN'S CLOTHING INDUSTRY, MISSISSIPPI, 1925

(United States Department of Labor, Women's Bureau, Bulletin 55, *Women in Mississippi Industries*, page 62.)

Weekly earnings	Number in textile industry	Number in five-and-ten-cent stores	Number in men's clothing industry
Under $1..	14	..	4
$1 and under 2..	12	3	9
2 and under 3..	27	3	13
3 and under 4..	40	3	18
4 and under 5..	71	2	26
5 and under 6..	84	2	35
6 and under 7..	96	13	45
7 and under 8..	129	42	40
8 and under 9..	104	74	29
9 and under 10..	79	33	15
10 and under 11..	73	7	19
11 and under 12..	63	3	13
12 and under 13..	45	6	5
13 and under 14..	16	3	7
14 and under 15..	14	..	6
15 and under 16..	6	..	3
16 and under 17..	9	..	4
17 and under 18..	6	..	..
18 and under 19..	5	..	1
19 and under 20..	4	..	1
20 and under 21..	3	..	2
21 and under 22..	1	..	..
22 and under 23..	1	..	..
Total.....	902	194	295

TABLE 19

PER CENT FAT CONTENT OF MILK AS SHOWN BY 8037 MILKING RECORDS

(Adapted from University of Illinois Agricultural Experiment Station, Bulletin 245, *Relation between Percentage Fat Content and Yield of Milk*, page 603.)

Per cent fat content (mid-values)	Number of records
3.85....	3
4.05....	41
4.25....	127
4.45....	303
4.65....	524
4.85....	852
5.05....	1033
5.25....	1106
5.45....	1137
5.65....	983
5.85....	799
6.05....	532
6.25....	281
6.45....	177
6.65....	80
6.85....	37
7.05....	16
7.25....	3
7.45....	3
Total...	8037

TABLE 20

YIELD OF MILK AS SHOWN BY 8037 MILKING RECORDS

(Adapted from University of Illinois Agricultural Experiment Station, Bulletin 245, *Relation between Percentage Fat Content and Yield of Milk*, page 603.)

Yield of milk in hundreds of pounds (mid-values)	Number of records
35.....	1
45.....	250
55.....	988
65.....	1593
75.....	1735
85.....	1348
95.....	853
105.....	542
115.....	330
125.....	187
135.....	100
145.....	59
155.....	28
165.....	14
175.....	7
185.....	1
195.....	1
Total.....	8037

TABLE 21

HEIGHTS OF 1575 WHITE BOYS, 12 AND UNDER 13 MONTHS OF AGE

(United States Department of Labor, Children's Bureau, *Statures and Weights of Children under Six Years of Age*, by Robert Morse Woodbury, page 87.)

Heights in inches (mid-values)	Number of boys
23.....	1
24.....	1
25.....	5
26.....	26
27.....	86
28.....	281
29.....	473
30.....	420
31.....	186
32.....	68
33.....	16
34.....	7
35.....	3
36.....	1
37.....	1
Total.....	1575

TABLE 22

WEIGHTS OF 1575 WHITE BOYS, 12 AND UNDER 13 MONTHS OF AGE

(United States Department of Labor, Children's Bureau, *Statures and Weights of Children under Six Years of Age*, by Robert Morse Woodbury, facing page 96.)

Weight in pounds (mid-values)	Number of boys
11	1
11½	..
12	..
12½	..
13	2
13½	..
14	1
14½	1
15	2
15½	5
16	13
16½	18
17	32
17½	45
18	75
18½	67
19	114
19½	88
20	148
20½	105
21	138
21½	87
22	122
22½	94
23	94
23½	49
24	83
24½	42
25	46
25½	31
26	21
26½	17
27	11
27½	6
28	8
28½	5
29	1
29½	1
30	1
30½	..
31	..
31½	..
32	1
Total	1575

TABLE 23

DRAFT OF VESSELS PASSING THROUGH THE PANAMA CANAL, FROM THE PACIFIC TO THE ATLANTIC, 1926

(Adapted from data in the *United States Daily*, November 2, 1926.)

Draft in feet	Number of vessels
10 and under 11	8
11 and under 12	9
12 and under 13	11
13 and under 14	20
14 and under 15	19
15 and under 16	25
16 and under 17	54
17 and under 18	32
18 and under 19	37
19 and under 20	54
20 and under 21	44
21 and under 22	77
22 and under 23	117
23 and under 24	208
24 and under 25	305
25 and under 26	298
26 and under 27	292
27 and under 28	282
28 and under 29	209
29 and under 30	119
30 and under 31	75
31 and under 32	30
32 and under 33	20
33 and under 34	33
34 and under 35	19
35 and over	2
Total	2399

TABLE 24

PER CENT FAT CONTENT OF MILK OF 163 COWS — DAUGHTERS OF GUERNSEY SIRES FOR WHICH TWO OR MORE DAUGHTERS ARE LISTED IN THE GUERNSEY ADVANCED REGISTRY

(University of Maine Agricultural Experiment Station, Bulletin 341, *Productivity of Guernsey Cows of American or Island Origin*, page 226.)

Per cent fat	Number of cows
4.0 but less than 4.2	1
4.2 but less than 4.4	2
4.4 but less than 4.6	18
4.6 but less than 4.8	35
4.8 but less than 5.0	45
5.0 but less than 5.2	31
5.2 but less than 5.4	24
5.4 but less than 5.6	6
5.6 but less than 5.8	1
Total.....	163

TABLE 25

WEIGHTS OF 1431 WHITE BOYS 1 AND UNDER 2 MONTHS OF AGE

(United States Department of Labor, Children's Bureau, *Statures and Weights of Children under Six Years of Age*, by Robert Morse Woodbury, facing page 96.

Weight in pounds	Number of boys
$5\frac{1}{4}$ but less than $6\frac{1}{4}$	12
$6\frac{1}{4}$ but less than $7\frac{1}{4}$	31
$7\frac{1}{4}$ but less than $8\frac{1}{4}$	87
$8\frac{1}{4}$ but less than $9\frac{1}{4}$	136
$9\frac{1}{4}$ but less than $10\frac{1}{4}$	254
$10\frac{1}{4}$ but less than $11\frac{1}{4}$	314
$11\frac{1}{4}$ but less than $12\frac{1}{4}$	282
$12\frac{1}{4}$ but less than $13\frac{1}{4}$	186
$13\frac{1}{4}$ but less than $14\frac{1}{4}$	81
$14\frac{1}{4}$ but less than $15\frac{1}{4}$	36
$15\frac{1}{4}$ but less than $16\frac{1}{4}$	10
$16\frac{1}{4}$ but less than $17\frac{1}{4}$	..
$17\frac{1}{4}$ but less than $18\frac{1}{4}$	..
$18\frac{1}{4}$ but less than $19\frac{1}{4}$	..
$19\frac{1}{4}$ but less than $20\frac{1}{4}$	1
$20\frac{1}{4}$ but less than $21\frac{1}{4}$	..
$21\frac{1}{4}$ but less than $22\frac{1}{4}$	1
Total.....	1431

TABLE 26

SIZES OF WOMEN'S WEDDING RINGS

(Courtesy, J. R. Wood and Sons and Miss Frieda Jacobsohn.)

Size	Number of rings
3...	2
$3\frac{1}{2}$..	13
4...	150
$4\frac{1}{2}$..	287
5...	694
$5\frac{1}{2}$..	816
6...	1210
$6\frac{1}{2}$..	1139
7...	1035
$7\frac{1}{2}$..	702
8...	481
$8\frac{1}{2}$..	252
9...	151
$9\frac{1}{2}$..	46
10...	40
$10\frac{1}{2}$..	16
11...	11
$11\frac{1}{2}$..	3
Total	7048

TABLE 27

NECK CIRCUMFERENCE OF WHITE TROOPS AT DEMOBILIZATION

(*The Medical Department of the United States Army in the World War*, Vol. XV, Part I, page 538.)

Neck circumference in centimeters	Number of men
Under 28.5	151
28.5 but less than 29.5	55
29.5 but less than 30.5	219
30.5 but less than 31.5	314
31.5 but less than 32.5	1,133
32.5 but less than 33.5	4,286
33.5 but less than 34.5	11,353
34.5 but less than 35.5	20,094
35.5 but less than 36.5	22,628
36.5 but less than 37.5	18,047
37.5 but less than 38.5	10,051
38.5 but less than 39.5	4,426
39.5 but less than 40.5	1,716
40.5 but less than 41.5	492
41.5 but less than 42.5	147
42.5 but less than 43.5	52
43.5 but less than 44.5	23
44.5 but less than 45.5	22
45.5 but less than 46.5	17
46.5 but less than 47.5	16
47.5 but less than 48.5	5
48.5 but less than 49.5	6
49.5 and over	18
Total	95,271

TABLE 28

DISTRIBUTION OF SIZES OF MEN'S COLLAR-ATTACHED SHIRTS

Shirt sizes in inches (and centimeters)	Number
13 (33.02)	500
13½ (34.29)	1,100
14 (35.56)	7,900
14½ (36.83)	21,750
15 (38.10)	25,000
15½ (39.37)	18,000
16 (40.64)	12,500
16½ (41.91)	7,400
17 (43.18)	3,700
17½ (44.45)	1,450
18 (45.72)	700
Total	100,000

TABLE 29

PER CENT FAT CONTENT OF MILK AS SHOWN BY SEMI-OFFICIAL TEST AND BY SEVEN-DAY TEST, BASED ON MILKING RECORDS OF 1295 COWS

(University of Illinois, Agricultural Experiment Station, Bulletin 215, *A Study of the Relative Reliability of Official Tests of Dairy Cows*, pages 332, 333.)

Per cent fat	Number (semi-official test)	Number (seven-day test)
2.21–2.40*.....	1	..
2.41–2.60.....	2	4
2.61–2.80.....	14	22
2.81–3.00.....	65	76
3.01–3.20.....	213	119
3.21–3.40.....	333	178
3.41–3.60.....	329	217
3.61–3.80.....	205	223
3.81–4.00.....	78	161
4.01–4.20.....	29	118
4.21–4.40.....	15	80
4.41–4.60.....	10	33
4.61–4.80.....	..	26
4.81–5.00.....	1	13
5.01–5.20.....	..	5
5.21–5.40.....	..	8
5.41–5.60.....	..	4
5.61–5.80.....	..	3
5.81–6.00.....	..	4
6.01–6.20.....	..	..
6.21–6.40.....	..	..
6.41–6.60.....	..	1
Total.....	1295	1295

* Note that the groups are written "2.21–2.40" rather than "2.20–2.39." The fat content was recorded to the nearest one-hundredth of one per cent. The mid-points should be located accordingly.

TABLE 30

YEARLY BUTTER-FAT PRODUCTION OF THIRTY COWS AS ASCERTAINED BY CONTINUOUS TEST AND BY SEMI-OFFICIAL TEST

(University of Illinois, Agricultural Experiment Station, Bulletin 215, *A Study of the Relative Reliability of Official Tests of Dairy Cows*, page 326.)

Fat production (pounds)	Number (continuous test)	Number (semi-official test)
251–300*.....	1	1
301–350.....	3	4
351–400.....	9	10
401–450.....	10	8
451–500.....	3	4
501–550.....	3	2
551–600.....	1	1
Total.....	30	30

* Note that the groups are written "251–300" rather than "250–299." The production figures were recorded to the nearest pound. The mid-points should be located accordingly.

TABLE 31

INDEX NUMBERS OF WHOLESALE PRICES OF RAW MATERIALS, SEMI-MANUFACTURED ARTICLES, AND FINISHED PRODUCTS, JANUARY, 1923 to JANUARY, 1928

1926 = 100

(*Monthly Labor Review*, March, 1928, page 195.)

RAW MATERIALS

Month	1923	1924	1925	1926	1927	1928
January	102.3	97.9	106.9	105.9	97.3	100.2
February	103.2	98.2	107.8	103.7	96.0	
March	102.8	96.5	108.0	100.9	94.0	
April	100.7	96.3	103.9	100.6	92.7	
May	98.1	94.4	104.1	100.6	93.9	
June	96.5	93.3	106.3	100.0	94.1	
July	94.5	95.9	109.0	98.5	94.7	
August	95.2	97.9	108.0	97.8	97.5	
September	98.0	97.1	107.3	99.3	99.9	
October	97.7	99.3	106.3	99.5	99.5	
November	97.0	100.1	107.4	98.2	99.0	
December	96.6	103.2	105.7	96.9	99.2	

SEMI-MANUFACTURED ARTICLES

Month	1923	1924	1925	1926	1927	1928
January	111.6	115.1	110.1	104.0	97.8	97.7
February	117.3	115.6	109.3	103.1	96.6	
March	125.8	114.3	108.0	101.0	96.6	
April	128.3	110.6	104.5	99.4	95.9	
May	125.2	106.3	102.5	98.3	96.0	
June	120.6	102.8	102.6	98.5	95.6	
July	116.3	102.4	102.9	98.7	95.7	
August	112.2	105.5	104.4	99.6	97.3	
September	116.0	106.0	105.0	100.4	98.6	
October	117.0	107.3	104.5	99.1	97.6	
November	116.5	108.9	105.3	98.9	97.0	
December	117.3	109.7	104.3	98.9	97.7	

FINISHED PRODUCTS

Month	1923	1924	1925	1926	1927	1928
January	100.4	98.6	99.9	102.1	95.9	93.9
February	101.3	98.7	101.4	101.0	95.8	
March	102.6	97.7	101.8	100.1	94.6	
April	102.5	96.2	100.7	99.9	94.1	
May	101.0	95.5	100.4	100.7	93.6	
June	99.9	95.0	101.2	101.1	93.4	
July	98.5	94.7	101.5	100.2	93.5	
August	97.4	95.6	101.2	99.6	93.4	
September	98.6	96.2	100.7	99.9	94.0	
October	98.1	96.7	101.4	99.3	95.5	
November	96.8	97.6	102.1	98.4	95.3	
December	96.6	99.9	101.5	98.4	95.3	

TABLE 32

WHOLESALE PRICE RELATIVES OF 83 SELECTED ITEMS OF FOOD, 1914, 1915, 1919, 1920, 1925, AND 1926

1913 = 100

(United States Bureau of Labor Statistics, *Wholesale Prices, 1890 to 1926*, Bulletin 440, pages 70–99.)

Commodities	1914	1915	1919	1920	1925	1926
Beef: fresh, carcass, good native steer, Chicago	105.3	99.5	180.2	177.9	139.2	126.8
Beef: fresh, steer, loins, Chicago	102.2	105.1	186.6	208.8	159.8	142.1
Beef: fresh, steer, ribs, No. 2, Chicago	103.1	93.2	199.9	200.6	158.2	134.5
Beef: fresh, steer, rounds, No. 2, Chicago	101.6	94.7	171.4	162.6	120.5	119.3
Beef: fresh, native sides, New York	107.5	100.2	171.6	164.4	126.6	120.3
Beef: fresh, loins, No. 2, City, New York	116.0	108.2	231.5	234.4	195.3	173.9
Beef: fresh, ribs, No. 2, City, New York	110.7	104.6	214.7	205.0	159.2	147.9
Beef: fresh, rounds, No. 2, City, New York	105.5	102.8	190.7	185.2	131.3	132.0
Beef: salt, extra mess	104.4	98.5	164.2	95.4	105.1	111.6
Hams, smoked	100.5	92.1	206.6	201.0	163.0	185.1
Lamb, dressed	101.9	110.0	186.3	195.8	181.0	175.9
Mutton, dressed	98.5	104.7	162.7	158.2	140.5	140.7
Pork: fresh, loins, Chicago	103.8	96.2	212.0	206.6	168.2	187.1
Pork: fresh, loins, western, New York	107.0	97.2	229.9	207.0	169.7	181.1
Pork: cured, salt, mess	101.2	81.5	232.3	165.6	173.2	166.6
Pork: cured, rough sides	104.8	91.3	215.5	155.6	175.7	160.5
Pork: cured, short clear sides	103.8	90.7	228.5	162.2	175.1	157.5
Poultry: dressed fowls, iced, Chicago	102.6	95.0	205.3	222.7	169.4	187.1
Poultry: dressed fowls, western, dry packed, New York	100.7	97.3	195.2	211.2	166.2	172.0
Butter: creamery, extra, Boston	92.6	92.2	188.6	189.2	142.8	138.4
Butter: creamery, firsts, Boston	91.7	91.7	194.3	191.2	146.4	141.7
Butter: creamery, seconds, Boston	89.1	91.2	199.8	189.2	150.3	142.3
Butter: creamery, extra, Chicago	92.6	91.4	188.7	188.1	142.4	138.1
Butter: creamery, extra firsts, Chicago	92.0	92.4	192.6	191.4	143.3	139.5
Butter: creamery, firsts, Chicago	91.3	92.3	197.5	189.6	147.0	141.6
Butter: creamery, fancy, New Orleans	94.1	93.2	185.3	188.1	145.3	141.6
Butter: creamery, choice, New Orleans	93.9	93.7	190.9	193.5	148.6	142.6
Butter: creamery, extra, New York	92.8	92.7	187.7	190.4	140.6	137.5
Butter: creamery, firsts, New York	92.6	93.5	191.5	190.1	144.0	139.2
Butter: creamery, seconds, New York	90.2	92.6	192.6	184.4	147.0	139.6
Butter: creamery, extra, Phila	93.1	92.6	189.0	191.6	141.9	139.5
Butter: creamery, extra firsts, Phila	92.9	92.2	190.7	193.2	144.0	141.4
Butter: creamery, firsts, Phila	92.1	91.8	188.0	184.8	141.1	135.7
Butter: creamery, extra, San Francisco	85.5	82.7	190.1	189.8	158.5	137.4
Butter: creamery, firsts, San Francisco	83.4	80.5	190.4	198.3	159.5	141.1
Cheese: whole milk, American twins, Chicago	101.4	100.4	211.9	184.5	161.8	153.0
Cheese: whole milk, colored, average fancy, New York	98.5	97.9	204.4	178.1	150.0	147.4
Cheese: California flats, fancy, San Francisco	93.0	82.5	204.2	192.7	158.3	143.5
Milk, condensed	97.1	98.3	174.7	202.6	125.7	124.6
Milk, evaporated	96.7	87.0	179.7	167.9	122.7	124.3
Bread: loaf, before baking, Chicago	100.0	102.8	177.0	218.7	174.5	174.5
Bread: loaf, before baking, Cincinnati	100.0	112.4	212.4	232.0	197.8	199.2
Bread: loaf, before baking, New Orleans	103.6	129.2	227.2	264.6	244.9	234.8
Bread: loaf, before baking, New York	104.0	112.0	175.5	205.7	165.1	165.1
Bread: loaf, before baking, San Francisco	100.0	101.3	178.5	204.5	194.5	192.8
Cocoa beans, Arriba	84.8	115.2	146.8	133.5	111.4	117.8
Coffee, Rio, No. 7	73.3	66.9	160.4	107.6	182.7	163.5

Table continued on next page

TABLE 32 — (*continued*)

Commodities	1914	1915	1919	1920	1925	1926
Coffee, Santos, No. 4	87.5	72.9	188.7	144.7	186.1	169.6
Copra, in bags	100.2	97.5	84.3	86.6	58.1	55.7
Crackers, oyster	100.0	109.7	234.5	269.2	215.4	215.4
Crackers, soda	100.0	109.7	234.5	269.2	215.4	215.4
Fish: cod, large shore (pickled, cured), Gloucester	104.4	110.6	147.4	137.6	114.9	108.2
Fish: mackerel, salt, large, No. 35	90.7	95.2	193.6	154.6	120.1	111.5
Flour: rye, Minneapolis	112.7	166.9	269.0	326.7	195.7	179.3
Flour: wheat, winter straights, Kansas City	107.2	145.9	278.0	301.0	199.6	188.5
Flour: wheat, second patents, Minneapolis	111.7	147.1	271.0	277.4	193.2	184.3
Flour: wheat, patents, Portland, Oregon	108.4	120.7	241.6	276.0	204.4	177.6
Flour: wheat, second patents, St. Louis	96.5	130.9	236.1	258.8	189.6	167.1
Fruits: canned, pineapples, Hawaiian, standard, $2\frac{1}{2}$	80.0	72.1	206.0	218.2	116.0	104.7
Fruits: dried, apples, evaporated, choice	131.2	107.5	267.8	235.1	174.8	164.5
Fruits: dried, prunes, California, in boxes	141.5	120.4	302.0	223.6	119.4	118.9
Fruits: fresh, apples, Baldwins	127.4	87.4	267.6	226.7	187.1	129.2
Fruits: fresh, lemons, California	71.9	52.5	94.6	74.8	128.8	96.5
Fruits: fresh, oranges, California	62.7	79.2	108.7	141.9	173.4	134.8
Glucose	101.1	107.3	257.2	251.9	184.8	160.9
Hominy Grits	108.2	101.0	210.6	191.6	127.0	94.4
Lard: prime contract	94.2	85.4	263.6	181.3	152.2	136.3
Meal: corn, fine white, f.o.b. mill	108.4	101.0	216.7	194.4	131.0	97.3
Oatmeal	108.9	125.7	192.0	210.1	134.8	124.2
Oleomargarine	99.0	97.4	210.8	195.8	149.5	140.4
Oleo oil	94.2	105.7	265.5	185.4	119.0	104.3
Pepper, black	107.3	125.1	186.5	130.7	169.4	235.9
Salt, American	100.0	104.9	201.3	267.1	216.0	215.2
Salt, granulated	100.0	100.0	246.8	250.4	237.2	231.1
Starch, corn	102.8	108.3	114.5	167.3	126.7	126.7
Sugar, 96° centrifugal	109.7	132.9	214.6	372.0	123.7	124.0
Sugar, granulated	110.3	130.2	209.4	296.7	128.1	128.3
Tallow, edible	93.3	95.4	238.4	175.0	129.1	119.9
Tea: Formosa, fine	100.0	96.7	142.3	135.7	141.1	142.8
Vegetables: canned, tomatoes, standard New Jersey, No. 3	77.6	76.0	157.7	138.8	115.1	110.3
Vegetable oil: corn, crude	101.6	103.8	288.1	246.8	199.8	198.3
Vegetable oil: cottonseed, summer yellow, prime	91.4	93.9	331.9	211.7	148.8	163.3
Vegetable oil: Soya bean, crude	102.9	102.1	272.6	247.6	215.5	205.9

TABLE 33

WHOLESALE PRICES OF CALIFORNIA LEMONS AND ORANGES, 1913–27, and APPROXIMATE QUANTITY SOLD IN 1919

(United States Bureau of Labor Statistics, *Wholesale Prices, 1890 to 1926*, Bulletin 440, pages 90, 91, and 219, and *Monthly Labor Review*, February, 1928, page 205.

Year	Lemons (per box)	Oranges (per box)	Year	Lemons (per box)	Oranges (per box)
1913.....	$5.773	$4.420	1922.....	$6.760	$7.849
1914.....	4.151	2.772	1923.....	6.510	5.168
1915.....	3.033	3.502	1924.....	5.323	5.798
1916.....	4.305	3.484	1925.....	7.435	7.662
1917.....	4.952	3.315	1926.....	5.571	5.957
1918.....	6.771	7.225	1927.....	7.826	7.094
1919.....	5.464	4.805			
1920.....	4.320	6.272	Quantity sold in 1919	boxes 4,536,000	boxes 22,075,000
1921.....	5.226	5.219			

TABLE 34

WHOLESALE PRICES OF LEATHER, 1913–27 AND APPROXIMATE QUANTITY SOLD IN 1919

(United States Bureau of Labor Statistics, *Wholesale Prices, 1890 to 1926*, Bulletin 440, pages 206, 207, and 224, and *Monthly Labor Review*, February, 1928, pages 206 and 207.)

Year	Chrome calf (per square foot)	Glazed kid (per square foot)	Harness, oak, California No. 1 (per pound)	Side, chrome (per square foot)	Sole, oak, scoured backs (per pound)	Sole, union (per pound)
1913.....	$.270	$.250	$.401	$.256	$.449	$.401
1914.....	.280	.260	.410	.268	.471	.422
1915.....	.285	.270	.443	.279	.504	.448
1916.....	.450	.497	.488	.325	.640	.629
1917.....	.579	.688	.675	.439	.831	.790
1918.....	.598	.663	.680	.412	.796	.709
1919.....	.970	1.015	.746	.640	.913	.841
1920.....	.985	1.073	.706	.617	.856	.836
1921.....	.521	.694	.430	.312	.548	.503
1922.....	.443	.704	.437	.258	.519	.491
1923.....	.443	.688	.457	.260	.508	.492
1924.....	.455	.673	.414	.264	.449	.406
1925.....	.472	.683	.440	.274	.482	.470
1926.....	.453	.675	.437	.253	.438	.429
1927.....	.489	.677	.468	.320	.493	.488
Quantity sold in 1919 (000 omitted) ...	sq. ft. 191,068	sq. ft. 161,860	lbs. 44,145	sq. ft. 220,565	lbs. 156,220	lbs. 113,287

TABLE 35

CROP PRICES AND PRODUCTION, 1913–26 *

Production in millions

(Price data from United States Bureau of Labor Statistics, *Wholesale Prices 1890 to 1926*, Bulletin 440. Production data from United States Department of Agriculture, *Yearbook of Agriculture, 1926*, and *Crops and Markets*, December, 1927.**)

Year	Corn (bu.)		Cotton (lb.)		Wheat (bu.)		Potatoes (bu.)		Oats (bu.)		Tobacco (lb.)		Barley (bu.)		Rice (bu.)		Cotton seed (short tons)		Rye (bu.)		Flaxseed (bu.)	
	Quantity	Price	Quantity	Price	Quantity	Price	Quantity	Price	Quantity	Price	Quantity	Price	Quantity	Price	Quantity	Price	Quantity	Price	Quantity	Price	Quantity	Price
1913	2,447	$.625	7,078	$.127	763	$.913	332	$.614	1,122	$.376	954	$.089	178	$.625	26	$2.295	6	$21.790	41	$.636	18	$1.349
1914	2,673	.695	8,068	.113	891	1.041	410	.693	1,141	.419	1,035	.075	195	.615	24	2.295	7	20.405	43	.768	14	1.525
1915	2,995	.730	5,596	.096	1,026	1.344	360	.455	1,549	.496	1,062	.069	229	.704	29	2.160	5	24.568	54	1.092	14	1.794
1916	2,567	.825	5,725	.141	636	1.417	287	1.111	1,252	.455	1,153	.103	182	.867	41	2.025	5	41.147	49	1.113	14	2.228
1917	3,065	1.637	5,651	.226	637	2.321	442	1.922	1,593	.637	1,249	.168	212	1.315	35	2.925	5	58.305	63	1.871	9	3.093
1918	2,503	1.605	6,021	.311	921	2.235	412	.972	1,538	.775	1,439	.230	256	1.305	39	4.005	5	66.185	91	1.940	13	3.940
1919	2,811	1.597	5,711	.319	968	2.563	323	1.427	1,184	.700	1,465	.221	148	1.217	42	4.770	5	65.563	75	1.534	7	4.533
1920	3,209	1.414	6,720	.330	833	2.601	403	2.606	1,496	.796	1,582	.146	189	1.263	52	4.815	6	51.728	60	1.873	11	3.792
1921	3,069	.580	3,977	.141	815	1.466	362	1.074	1,078	.387	1,070	.118	155	.635	38	1.980	4	22.183	62	1.213	8	1.849
1922	2,906	.623	4,878	.204	868	1.282	453	1.016	1,216	.396	1,247	.145	182	.633	41	2.655	4	35.039	103	.883	10	2.477
1923	3,054	.821	5,070	.287	797	1.155	416	.874	1,306	.439	1,515	.151	198	.660	34	2.475	5	43.690	63	.752	17	2.737
1924	2,309	.972	6,814	.279	864	1.322	422	.823	1,503	.514	1,251	.147	182	.817	32	2.655	6	38.345	65	.916	32	2.501
1925	2,917	1.038	8,052	.230	676	1.666	323	1.263	1,488	.467	1,377	.139	217	.844	33	3.150	7	35.069	46	1.128	22	2.721
1926	2,692	.759	8,989	.168	831	1.552	354	1.808	1,247	.430	1,298	.085	185	.694	42	3.285	8	27.197	41	.954	19	2.328

* Comparable price data for 1927 not available for all items.

** The specific grade or type of each commodity, the price of which is taken as representative, is as follows: — corn, cash, contract grades; cotton, middling, New Orleans; wheat, cash, Chicago, No. 1 Northern spring; potatoes, white, good to choice; oats, cash; tobacco, leaf, average warehouse sales, Kentucky; barley, by sample, fair to good malting; rice, Honduras head; rye, cash, No. 2; flaxseed, No. 1, Minneapolis market. Price data have been converted as follows: — potatoes per 100 pounds changed to per bushel by multiplying by .6; tobacco per 100 pounds changed to per pound; rice per pound changed to per bushel by multiplying by 45.

Production data combine all types and grades for each commodity. Production data for cotton in 500 pound bales changed to pounds.

TABLE 36

AGRICULTURAL DATA BY COUNTIES, ILLINOIS, 1920 and 1925

(United States Bureau of the Census, *Census of Agriculture, 1920*, Vol. VI, Illinois County Table I; *Census of Agriculture, 1925*, Illinois Bulletin, County Tables I, II, and IV.)

County	Value of crops per acre, 1925 *	Value of land per acre, 1925	Improved acreage per farm, 1920	Value of land and buildings per farm, 1920	Per cent of farms operated by tenants, 1920	Average acreage per farm, 1920	Per cent of farms operated by owners, 1920
Adams	$13.23	$80.41	97.1	$18,312	38.6	129.1	60.1
Alexander	13.10	57.26	85.3	9,982	42.0	132.2	56.0
Bond	6.39	37.07	100.4	9,067	34.1	114.1	65.5
Boone	14.03	99.23	108.3	26,070	46.4	131.0	52.6
Brown	10.24	68.93	91 1	15,539	35.7	131.5	63.2
Bureau	18.52	146.84	143.2	42,638	51.1	162.4	47.5
Calhoun	11.90	61.36	74.7	12,284	32.4	135.7	66.8
Carroll	11.27	97.52	127.1	26,389	42.3	153.2	55.1
Cass	17.89	109.28	144.1	30,393	41.8	182.5	57.0
Champaign	21.16	181.87	161.2	60,146	60.6	165.0	35.9
Christian	19.05	133.49	141.6	34,063	56.5	149.9	42.3
Clark	7.93	52.61	86.5	9,864	28.6	106.1	70.7
Clay	5.75	36.20	99.1	6,864	29.8	111.4	68.4
Clinton	8.49	47.19	122.5	11,575	51.5	148.3	47.7
Coles	17.87	134.78	111.0	28,029	43.0	122.7	54.2
Cook	13.85	343.44	57.2	17,103	41.4	65.7	56.5
Crawford	7.61	50.93	98.0	9,909	27.7	110.7	70.6
Cumberland	7.76	47.62	90.1	9,306	32.2	100.9	67.3
De Kalb	19.33	152.04	147.4	44,079	51.0	157.7	47.6
De Witt	21.36	164.06	141.7	50,438	59.5	155.9	37.2
Douglas	23.53	177.35	150.4	53,352	57.2	157.2	39.1
Du Page	15.96	168.96	88.6	23,273	42.7	107.1	53.2
Edgar	18.53	134.75	139.0	37,120	45.5	151.7	53.2
Edwards	10.48	43.39	106.5	9,755	21.4	118.2	78.0
Effingham	6.60	39.39	101.9	8,128	28.1	122.7	71.3
Fayette	7.32	41.38	92.3	8,003	33.3	110.4	65.7
Ford	21.38	171.30	175.9	56,813	70.5	178.8	28.6
Franklin	4.35	35.87	75.3	5,416	21.4	85.8	78.1
Fulton	13.41	114.23	103.1	24,981	45.9	144.4	52.8
Gallatin	13.11	56.50	98.0	11,687	37.9	116.9	61.5
Greene	12.50	82.86	120.6	21,303	42.9	149.8	55.4
Grundy	19.75	145.62	149.4	43,744	61.7	166.7	37.3
Hamilton	6.09	33.71	80.1	4,943	24.0	90.0	75.4
Hancock	13.45	116.75	105.7	24,832	37.5	133.5	61.4
Hardin	4.38	15.82	81.5	3,849	23.6	119.0	75.7
Henderson	13.80	119.04	143.4	33,520	50.2	177.9	48.7
Henry	17.24	150.14	135.3	35,415	50.7	153.5	47.4
Iroquois	18.36	152.12	162.2	45,572	63.1	170.6	34.8
Jackson	8.99	44.93	91.0	8,668	29.2	128.9	69.5
Jasper	7.48	39.68	97.1	7,396	25.5	107.5	74.0
Jefferson	4.77	37.25	79.5	5,354	23.4	90.5	76.1
Jersey	7.01	57.31	111.1	15,998	37.8	154.0	60.5
Jo Daviess	8.27	68.76	108.3	21,143	27.6	162.7	71.4
Johnson	5.26	26.11	79.5	4,669	20.8	110.8	78.2

* Crop year 1924.

Table continued on next page.

TABLE 36 — *continued*

County	Value of crops per acre, 1925 *	Value of land per acre, 1925	Improved acreage per farm, 1920	Value of land and buildings per farm, 1920	Per cent of farms operated by tenants, 1920	Average acreage per farm, 1920	Per cent of farms operated by owners, 1920
Kane	$18.91	$128.28	113.2	$29,811	45.8	134.2	51.2
Kankakee	16.68	129.38	147.8	34,246	50.8	160.1	47.6
Kendall	22.57	155.50	143.7	46,003	52.8	157.8	46.5
Knox	16.81	143.64	121.5	37,769	46.1	152.9	52.4
Lake	11.64	156.21	75.2	21,858	35.9	105.8	58.6
La Salle	21.47	170.53	143.1	47,234	52.5	158.7	45.9
Lawrence	9.43	50.08	105.6	10,205	33.6	119.7	65.6
Lee	18.17	131.07	151.5	39,792	53.1	166.9	45.4
Livingston	23.92	186.07	165.5	58,171	65.9	170.9	32.1
Logan	23.63	175.68	158.9	50,278	64.7	167.1	33.0
McDonough	16.00	147.56	106.0	30,220	47.1	130.2	51.4
McHenry	12.54	95.32	92.0	22,263	46.1	128.3	52.1
McLean	22.59	195.25	158.7	57,937	57.9	165.8	39.6
Macon	22.20	175.07	131.8	45,210	57.9	138.5	39.7
Macoupin	10.24	65.13	105.3	16,918	44.9	135.0	54.0
Madison	9.09	70.56	99.5	13,405	43.9	115.6	55.3
Marion	4.53	34.45	90.7	6,081	22.8	106.8	76.3
Marshall	19.38	161.98	150.4	44,576	58.8	183.3	40.3
Mason	17.18	128.59	172.7	32,267	60.5	199.9	38.4
Massac	6.63	33.01	79.0	6,103	24.7	101.6	74.9
Menard	18.35	142.37	160.6	41,452	46.2	180.6	53.2
Mercer	13.27	127.66	129.7	33,384	44.9	160.6	53.7
Monroe	11.64	47.73	109.5	10,725	51.6	143.9	48.2
Montgomery	9.77	67.28	117.8	17,946	42.4	134.4	56.1
Morgan	18.92	132.57	122.8	29,556	42.8	139.5	55.5
Moultrie	22.22	150.93	126.6	39,416	54.6	137.8	42.5
Ogle	14.45	114.06	137.4	32,148	49.9	161.9	48.0
Peoria	16.75	135.21	105.5	29,213	44.3	139.5	54.3
Perry	5.74	32.28	99.1	7,056	26.1	124.4	73.2
Piatt	24.66	183.80	182.5	66,062	61.7	189.1	32.0
Pike	13.28	71.49	110.9	16,474	38.2	140.5	59.3
Pope	4.38	17.83	82.2	3,892	20.7	121.5	79.3
Pulaski	9.47	46.91	77.6	7,570	31.4	98.3	67.8
Putnam	18.77	143.15	126.9	36,736	49.5	171.2	49.7
Randolph	8.36	33.24	106.5	8,653	40.1	139.0	59.4
Richland	7.24	37.11	96.5	6,392	20.1	106.7	79.0
Rock Island	12.83	126.07	87.3	23,290	38.7	119.2	60.1
St. Clair	11.17	78.75	97.8	13,221	52.0	114.5	47.5
Saline	7.69	51.88	84.2	7,377	22.9	97.0	76.3
Sangamon	20.89	162.87	134.7	33,964	46.3	145.0	52.4
Schuyler	12.22	84.16	99.9	21,283	39.7	144.3	59.6
Scott	17.05	98.00	113.6	21,575	46.6	138.2	52.6
Shelby	13.11	96.39	105.1	18,892	40.8	117.2	57.9
Stark	18.04	148.13	146.2	42,998	48.9	165.6	48.3
Stephenson	14.25	104.36	104.4	21,845	38.5	120.8	60.9
Tazewell	20.73	166.67	131.6	40,483	48.5	151.2	50.4
Union	11.08	40.20	74.8	7,295	30.3	108.6	68.1
Vermilion	15.12	134.47	133.6	36,529	50.6	144.8	47 6
Wabash	13.76	68.25	109.6	15,582	36.8	121.7	62 1

* Crop year 1924.

Table continued on next page.

TABLE 36 — *continued*

County	Value of crops per acre, 1925 *	Value of land per acre, 1925	Improved acreage per farm, 1920	Value of land and buildings per farm, 1920	Per cent of farms operated by tenants, 1920	Average acreage per farm, 1920	Per cent of farms operated by owners, 1920
Warren.....	$17.44	$168.17	142.5	$43,132	48.7	168.0	50.7
Washington..	6.42	44.16	113.8	9,544	38.4	140.1	61.2
Wayne.....	6.61	35.47	92.6	6,191	26.2	103.6	73.5
White.....	12.39	52.15	107.5	11,226	37.6	117.3	61.4
Whiteside ...	16.64	109.88	132.5	30,139	56.1	149.0	42.6
Will.....	15.97	121.30	127.3	29,323	46.4	144.2	52.6
Williamson..	5.64	35.93	69.9	4,427	21.6	84.2	77.7
Winnebago..	12.30	92.68	113.5	24,557	43.3	133.8	55.5
Woodford ...	22.22	183.71	132.8	48,396	53.8	154.0	45.2

* Crop year 1924.

TABLE 37

PER CAPITA EXPENDITURES FOR SCHOOLS AND FOR RECREATION, IN CITIES OF 100,000 OR MORE INHABITANTS, 1925

(United States Bureau of the Census, *Financial Statistics of Cities, 1925*, pages 326–29.)

City	Per capita expenditure for schools	Per capita expenditure for recreation	City	Per capita expenditure for schools	Per capita expenditure for recreation
New York, N.Y.	$17.83	$1.08	New Haven, Conn.	$14.71	$1.13
Chicago, Ill.	13.52	1.97	Memphis, Tenn.	8.87	1.78
Philadelphia, Pa.	11.30	1.49	Dayton, Ohio	11.87	.52
Detroit, Mich.	12.22	1.75	Norfolk, Va.	(*)	(*)
Cleveland, Ohio	15.59	.59	Houston, Tex.	(*)	(*)
St. Louis, Mo.	10.56	1.56	Bridgeport, Conn.	(*)	(*)
Baltimore, Md.	9.14	1.27	Youngstown, Ohio	12.94	.91
Boston, Mass.	17.67	3.14	Hartford, Conn.	16.49	1.86
Los Angeles, Calif.	(*)	(*)	Fort Worth, Tex.	9.08	.77
Pittsburgh, Pa.	16.10	1.00	Grand Rapids, Mich.	17.28	1.25
San Francisco, Calif.	10.42	1.66	Springfield, Mass.	19.05	2.06
Buffalo, N.Y.	15.82	2.32	Scranton, Pa.	13.18	.90
Milwaukee, Wis.	13.66	2.59	Paterson, N.J.	16.03	.90
Washington, D.C.	14.47	2.22	Des Moines, Iowa	18.00	1.05
Newark, N.J.	17.34	1.30	Nashville, Tenn.	6.19	.91
Minneapolis, Minn.	15.85	1.77	Trenton, N.J.	14.30	.92
New Orleans, La.	8.63	.62	Salt Lake City, Utah	15.42	1.33
Cincinnati, Ohio	15.52	.28	Fall River, Mass.	14.39	1.08
Kansas City, Mo.	14.15	1.06	Camden, N.J.	13.38	.53
Seattle, Wash.	(*)	(*)	Flint, Mich.	11.14	.71
Indianapolis, Ind.	13.40	1.40	Wilmington, Del.	9.01	.79
Rochester, N.Y.	18.61	1.99	New Bedford, Mass.	15.10	1.16
Jersey City, N.J.	13.40	1.50	Cambridge, Mass.	11.36	1.89
Louisville, Ky.	9.29	.64	Erie, Pa.	(*)	(*)
Toledo, Ohio	13.89	.54	Tulsa, Okla.	13.24	.82
Portland, Oreg.	(*)	(*)	Albany, N.Y.	10.56	1.56
Akron, Ohio	(*)	(*)	Kansas City, Kans.	12.41	.54
Denver, Colo.	14.87	2.19	Yonkers, N.Y.	20.90	.96
Columbus, Ohio	11.31	.40	Reading, Pa.	9.23	.67
Providence, R.I.	11.79	.95	Duluth, Minn.	15.03	.74
Oakland, Calif.	16.54	1.59	Lowell, Mass.	13.64	.72
St. Paul, Minn.	12.89	1.39	Spokane, Wash.	15.33	1.19
Atlanta, Ga.	(*)	(*)	Elizabeth, N.J.	(*)	(*)
Omaha, Nebr.	15.69	.87	Canton, Ohio	11.60	.22
Birmingham, Ala.	9.30	.36	San Diego, Calif.	15.99	2.25
San Antonio, Tex.	8.99	1.01	Oklahoma City, Okla.	(*)	(*)
Worcester, Mass.	16.45	1.00	Tacoma, Wash.	13.30	1.21
Dallas, Tex.	10.07	1.19	Lynn, Mass.	12.33	1.35
Richmond, Va.	9.64	.55	Waterbury, Conn.	(*)	(*)
Syracuse, N.Y.	13.77	1.18	Utica, N.Y.	12.65	.90
			El Paso, Tex.	9.40	.88

* No per capita data computed because of unsatisfactory post-censal estimates of population for these cities.

TABLE 38

PER CENT NATIVE WHITE AND PER CENT ILLITERATE TEN YEARS OF AGE AND OVER IN THE POPULATION OF PENNSYLVANIA, BY COUNTIES, 1920

(*Fourteenth Census of the United States*, Vol. III, pages 859–65.)

County	Per cent native white	Per cent illiterate	County	Per cent native white	Per cent illiterate
Adams	98.7	1.6	Lackawanna	77.1	8.6
Allegheny	74.5	4.8	Lancaster	96.3	1.4
Armstrong	86.4	4.3	Lawrence	80.2	6.5
Beaver	75.9	6.2	Lebanon	95.3	2.5
Bedford	96.9	3.2	Lehigh	89.3	2.3
Berks	93.4	2.7	Luzerne	77.3	9.5
Blair	92.2	2.6	Lycoming	94.4	1.5
Bradford	96.2	2.0	McKeon	86.2	1.8
Bucks	87.6	2.5	Mercer	80.0	6.2
Butler	89.6	3.0	Mifflin	96.4	2.4
Cambria	79.2	6.3	Monroe	95.0	2.3
Cameron	89.9	2.6	Montgomery	83.4	3.6
Carbon	82.3	8.3	Montour	94.2	4.8
Center	93.5	1.8	Northampton	81.9	5.2
Chester	81.7	4.5	Northumberland	88.9	4.7
Clarion	96.4	1.8	Perry	98.9	1.5
Clearfield	85.9	4.4	Philadelphia	70.7	4.0
Clinton	93.0	2.5	Pike	90.6	1.3
Columbia	93.0	2.8	Potter	93.0	1.9
Crawford	92.3	1.5	Schuylkill	84.0	7.9
Cumberland	96.2	1.4	Snyder	99.8	2.1
Dauphin	87.8	3.3	Somerset	84.3	6.4
Delaware	75.8	4.4	Sullivan	90.4	4.5
Elk	81.6	3.1	Susquehanna	91.0	2.8
Erie	84.8	4.0	Tioga	93.4	2.4
Fayette	76.3	8.2	Union	99.3	1.4
Forest	94.1	2.7	Venango	92.7	3.5
Franklin	97.0	1.8	Warren	86.2	3.3
Fulton	98.9	2.3	Washington	74.0	7.3
Greene	93.5	4.4	Wayne	90.9	2.8
Huntingdon	93.1	4.0	Westmoreland	77.8	7.6
Indiana	82.4	5.9	Wyoming	96.0	1.6
Jefferson	88.0	3.5	York	97.2	1.6
Juniata	99.1	1.2			

TABLE 39

CORRELATION TABLE OF VOTE ON SUFFRAGE AND VOTE ON PROHIBITION IN 200 PRECINCTS OF CUYAHOGA COUNTY, OHIO

(Adapted from C. E. Gehlke, "On the Correlation between the Vote for Suffrage and the Vote on the Liquor Question," *Quarterly Publication, American Statistical Association*, March, 1917, pages 530–31.)

Per cent of Vote on Prohibition Cast in favor of Prohibition	Per cent of Vote on Suffrage Cast in Favor of Suffrage														
	5–9.9	10–14.9	15–19.9	20–24.9	25–29.9	30–34.9	35–39.9	40–44.9	45–49.9	50–54.9	55–59.9	60–64.9	65–69.9	70–74.9	Total
75–79.9									2						2
70–74.9															..
65–69.9												1			1
60–64.9												1	1		2
55–59.9					1		1		1	1	2	1			7
50–54.9								1	3	12	6	1			23
45–49.9			1					2	3	7	3				16
40–44.9							5	11	3	3				1	23
35–39.9				1		6	2	5	2						16
30–34.9		1		1	4	4	5	3							18
25–29.9			1	2	4	3	4	2							16
20–24.9			4	8	6	1									19
15–19.9		2	8	9	2										21
10–14.9	2	6	5	2	2										17
5– 9.9	8	8				1									17
0– 4.9	1	1													2
Total	11	18	19	23	19	15	17	24	14	23	11	4	1	1	200

TABLE 40

PER CENT NEGRO, PER CENT NATIVE WHITE, AND PER CENT ILLITERATE, TEN YEARS OF AGE AND OVER, IN THE POPULATION OF MISSISSIPPI, BY COUNTIES, 1920

(United States Bureau of the Census, *Fourteenth Census of the United States*, Volume III, pages 533–47.)

County	Per cent negro	Per cent illiterate	Per cent white	County	Per cent negro	Per cent illiterate	Per cent white
Adams	68.7	22.4	29.9	Leflore	78.0	22.1	21.1
Alcorn	19.2	9.1	80.6	Lincoln	36.4	12.0	63.2
Amite	49.3	15.4	50.6	Lowndes	64.9	23.5	34.8
Attala	40.9	13.0	59.0	Madison	78.0	25.2	21.6
Benton	46.9	19.4	53.0	Marion	35.7	13.3	64.1
Bolivar	82.4	22.9	16.5	Marshall	72.2	21.5	27.7
Calhoun	17.2	10.7	82.8	Monroe	47.1	16.4	52.8
Carroll	55.9	15.0	44.1	Montgomery	41.5	9.7	58.3
Chickasaw	49.8	16.6	50.1	Neshoba	15.3	9.9	82.2
Choctaw	28.4	10.7	71.5	Newton	33.6	12.9	65.8
Claiborne	73.7	23.2	25.9	Noxubee	79.3	28.9	20.6
Clarke	40.3	14.0	59.4	Oktibbeha	59.6	21.1	40.2
Clay	59.9	19.2	39.7	Panola	63.7	20.4	36.1
Coahoma	84.8	25.6	14.0	Pearl River	27.5	13.8	72.1
Copiah	52.7	14.2	47.1	Perry	33.0	8.1	66.8
Covington	28.8	8.2	71.1	Pike	46.8	13.5	52.5
De Soto	75.7	27.8	24.1	Pontotoc	21.5	5.1	78.4
Forrest	34.1	8.2	65.0	Prentiss	13.8	9.3	86.1
Franklin	39.7	20.3	60.2	Quitman	75.8	23.2	24.1
George	16.5	7.7	83.1	Rankin	55.7	15.3	44.1
Greene	25.5	9.2	74.4	Scott	37.5	9.4	62.2
Grenada	62.1	18.0	37.6	Sharkey	83.0	29.4	16.4
Hancock	25.9	13.5	71.9	Simpson	33.2	11.2	66.8
Harrison	23.9	7.8	72.6	Smith	16.0	9.1	83.9
Hinds	62.6	15.6	36.9	Stone	35.6	10.1	64.0
Holmes	77.2	18.0	22.6	Sunflower	74.2	23.3	25.2
Humphreys	82.2	26.1	17.3	Tallahatchie	70.4	25.5	29.3
Issaquena	90.8	44.7	9.0	Tate	58.9	21.1	41.0
Itawamba	6.9	9.9	93.1	Tippah	15.6	7.9	84.4
Jackson	25.2	8.4	72.3	Tishomingo	6.0	10.3	93.9
Jasper	47.8	12.8	52.0	Tunica	89.3	45.3	10.4
Jefferson	75.0	25.3	24.8	Union	21.3	8.8	78.7
Jefferson Davis	52.9	10.2	47.0	Walthall	42.1	16.5	57.8
Jones	27.7	9.7	71.7	Warren	63.9	15.9	34.5
Kemper	56.5	19.1	42.9	Washington	81.5	27.9	17.2
Lafayette	41.4	9.6	58.5	Wayne	35.2	15.0	64.6
Lamar	25.5	11.1	73.9	Webster	18.7	5.9	81.2
Lauderdale	40.9	12.5	58.5	Wilkinson	73.9	25.5	25.9
Lawrence	39.4	11.7	60.6	Winston	35.7	9.8	64.2
Leake	34.0	11.0	64.9	Yalobusha	45.2	12.4	54.5
Lee	32.9	12.0	66.9	Yazoo	71.7	19.7	28.0

TABLE 41

CORRELATION TABLE OF SCORE ON MENTAL TEST AND ACCOMPLISHMENT IN PRODUCTION

(Adapted from Harry A. Wembridge, "Experiment and Statistics in the Selection of Employees," *Journal of the American Statistical Association*, March, 1923, page 605.)

Per cent of Standard in Production	Points on Mental Test											
	10–14	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	Total
160–169								1	4	1		6
150–159							2	1	2		1	6
140–149							1	1	3		1	6
130–139					1			1	2	2	1	7
120–129							2	3	2		1	8
110–119					1	3	1	4	4	4		17
100–109					5	7	8	11	8	7		46
90– 99				2	1	10	12	9	8	2		44
80– 89			1	3	12	11	7	12	7	1		54
70– 79		1	2	1	5	6	16	8	5			44
60– 69	2	1	2	5	5	8	8	6	1			38
50– 59			2	3	3	4	1	1				14
Total	2	2	7	14	33	49	58	58	46	17	4	290

Table 42

Correlation Table of Heights and Weights of a Group of White Boys, Nine and under Twelve Months of age

(Courtesy, United States Children's Bureau, unpublished data.)

Weight in pounds (mid-values)	Height in inches (mid-values)																
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	Total
29.5												3	2			1	6
28.0										5	7	5	5	3	2	1	28
26.5								1	11	20	22	8	13	4	2	1	82
25.0							2	11	64	69	36	25	7	5		1	220
23.5						1	10	80	146	134	64	18	18	3			474
22.0			1			8	48	185	300	202	63	13	2				822
20.5	1				8	42	151	450	464	200	45	11					1372
19.0				1	9	39	231	449	304	81	9	3					1126
17.5			2	2	16	87	289	312	145	20							873
16.0				3	23	76	152	107	21								382
14.5				4	20	40	38	3									105
13.0			1	4	3	4	1										13
11.5			1	2	2												5
Total	1	..	5	16	81	297	922	1598	1455	731	246	86	47	15	4	4	5508

TABLE 43

AVERAGE VALUE OF CROPS PER ACRE * AND AVERAGE VALUE OF LAND PER ACRE IN THE COUNTIES OF WYOMING, 1925

(United States Bureau of the Census, *Census of Agriculture, 1925*, Wyoming Bulletin, County Tables I, II, and IV.)

County	Average value of crops per acre	Average value of land per acre	County	Average value of crops per acre	Average value of land per acre
Albany	$.70	$8.13	Natrona	$.22	$4.28
Big Horn	7.15	29.75	Niobrara	.37	7.51
Campbell	.39	5.54	Park	3.31	15.84
Carbon	.75	4.87	Platte	1.35	10.27
Converse	.36	5.19	Sheridan	1.26	10.58
Crook	.68	7.59	Sublette	3.08	13.73
Fremont	.89	5.87	Sweetwater	.69	6.89
Goshen	2.22	12.52	Teton	4.73	24.58
Hot Springs	1.40	13.02	Uinta	2.01	12.89
Johnson	.74	7.33	Washakie	8.08	31.24
Laramie	.70	7.55	Weston	.42	4.10
Lincoln	2.19	11.20			

* Crop year 1924.

TABLE 44

AVERAGE VALUE OF CROPS PER ACRE * AND AVERAGE VALUE OF LAND PER ACRE IN THE COUNTIES OF NORTH DAKOTA, 1925

(United States Bureau of the Census, *Census of Agriculture, 1925*, North Dakota Bulletin, County Tables I, II, and IV.)

County	Average value of crops per acre	Average value of land per acre	County	Average value of crops per acre	Average value of land per acre
Adams	$5.02	$15.16	Grant	$5.18	$14.54
Barnes	10.86	34.18	Griggs	9.45	29.76
Benson	9.42	23.81	Hettinger	7.68	18.28
Billings	3.07	8.23	Kidder	5.58	16.89
Bottineau	9.83	21.11	La Moure	8.19	28.17
Bowman	3.73	13.82	Logan	6.68	19.51
Burke	7.97	18.62	McHenry	8.32	19.50
Burleigh	5.50	17.17	McIntosh	6.97	23.05
Cass	12.59	46.22	McKenzie	4.93	9.64
Cavalier	11.00	29.91	McLean	8.02	18.37
Dickey	6.47	29.98	Mercer	6.31	16.47
Divide	9.12	19.30	Morton	5.42	16.22
Dunn	4.32	11.56	Mountrail	7.73	15.65
Eddy	7.88	24.67	Nelson	9.89	32.33
Emmons	7.17	25.24	Oliver	5.88	17.54
Foster	9.33	26.41	Pembina	10.79	35.53
Golden Valley	5.32	14.81	Pierce	7.89	21.94
Grand Forks	11.77	38.08	Ramsey	11.76	29.19

* Crop year 1924.

Table continued on next page.

TABLE 44 — *continued*

County	Average value of crops per acre	Average value of land per acre	County	Average value of crops per acre	Average value of land per acre
Ransom	$8.07	$34.52	Steele	$11.50	$38.37
Renville	9.30	20.01	Stutsman	9.29	23.29
Richland	11.52	43.39	Towner	9.81	29.55
Rolette	5.85	19.30	Traill	13.02	44.27
Sargent	8.76	34.83	Walsh	13.43	35.49
Sheridan	8.30	17.33	Ward	9.06	20.36
Sioux	3.65	9.79.	Wells	11.27	29.51
Slope	4.37	11.03	Williams	6.94	14.31
Stark	7.38	15.83			

TABLE 45

MARGIN OF SAFETY * AND YIELD OF SIXTY PUBLIC UTILITY BONDS, AVERAGE 1922–25

(Courtesy, Gillette and Malcomson, 132 Nassau Street, New York City.)

Bond	Description	Margin of safety	Yield
American Gas and Elect.	Coll.	95.1	5.59
American Tel. and Tel.	Coll.	92.4	5.08
Arkansas Lt. and Power	1st	68.8	6.39
Blackstone Valley G. and E.		80.4	5.11
Brooklyn Edison Company	Gen. M.	72.1	5.13
Brooklyn Union Gas	1st Cons.	79.5	5.18
Buffalo General Elect.	1st	95.3	4.99
Central Ill. Public Service	1st and Ref.	67.9	6.26
Cleveland Elect. Illum.	1st	85.2	5.04
Columbus (Ga.) El. and Pwr.		61.7	5.86
Columbus R. P. and L.	1st Ref.	65.2	5.78
Commonwealth Electric	1st	81.0	5.09
Commonwealth Edison Co.	1st	73.9	5.33
Connecticut Light and Power	1st Ref.	66.1	6.15
Connecticut Power Company	1st Coll.	87.5	5.22
Consolidated G.E.L. and P. (Balt.)	1st Ref.	64.8	5.71
Consumers Power (Mich.)	1st Ref.	82.1	5.35
Duquesne Light Company		70.0	5.68
East Bay Water Company	Un. and Ref.	41.6	6.85
Eastern Wisconsin Electric	1st and Ref.	75.6	5.97
Elmira Water L. and R.R.	1st and Cons.	62.2	5.69
Federal Light and Traction	1st	82.1	6.20
Great Western Power	1st and Ref.	44.2	6.04
Ill. Northern Util.	1st and Ref.	62.4	6.20
Los Angeles Gas and Electric	1st Ref.	90.4	5.26
Milwaukee El. Ry. and Lt.	Gen. and Ref.	78.1	5.55
Mississippi River Power		56.4	5.37

Table continued on next page.

* Margin of safety may be defined as, "the percentage of net earnings available for fixed charges which remains after deducting from those net earnings the interest charges for a given bond and those of all prior liens." H. P. Gillette and A. S. Malcomson, *The Annalist*, November 12, 1926, page 627.

TABLE 45 — *continued*

Bond	Description	Margin of safety	Yield
Montana Power Company	1st and Ref.	66.9	5.23
Mountain States Power	1st and Ref.	45.4	6.42
Municipal Gas (Albany)	1st Mtg.	89.7	5.19
Nebraska Power Company	1st	73.3	5.42
Newport News and H.R.G. and E.	1st Ref.	54.2	6.84
New York Telephone Co.	Ref. Mtg.	70.3	5.72
Niagara Falls Power Co.	1st and Cons.	59.0	5.63
Northern Ohio Tract. and Lt.	Gen. and Ref.	46.5	6.59
Northern States Power (Del.)	1st and Ref.	66.6	5.68
Northern Texas Elect.	Coll. Tr.	58.4	6.74
Pacific Gas and Electric	1st and Ref.	53.0	6.13
Pacific Tel. and Tel.	1st and Coll.	75.2	5.18
Peoples Gas Light and Coke	1st Cons.	81.1	5.41
Philadelphia Company	1st Coll.	98.2	4.94
Philadelphia Electric	1st L. and Ref.	70.3	5.54
Phila. Rapid Transit	Coll. Tr.	88.5	6.04
Phila. and Western Rwy.		54.3	5.91
Pine Bluff Company		67.0	6.10
Portland Rwy. Lt. and Power		42.0	7.03
Pub. Service Nor. Ill.	1st and Ref.	72.8	5.74
Rochester Gas and Electric	Gen. Mtg.	58.7	6.26
Southern California Edison	Gen.	91.1	5.20
Tenn. Electric Power	1st and Ref.	58.0	6.26
Troy (N.Y.) Gas Co.	Consol.	95.9	5.32
United Illum. Co. (N.H.)	1st	95.2	4.71
Utah Power and Light	1st	63.7	5.70
Utica Gas and Elect.	Ref. and Ext.	77.7	5.37
Wash. (D.C.) Gas Light		76.4	5.26
Washington Rwy. and Electric		59.6	5.88
Washington Water Power	1st and Ref.	86.6	5.07
Western Union Tel.		84.3	5.41
West Penn. Power	1st Mtg.	61.8	5.49
York Railways	1st Mtg.	60.3	5.95

TABLE 46

AVERAGE ACREAGE PER FARM AND AVERAGE VALUE OF LAND PER ACRE IN THE COUNTIES OF NEBRASKA, 1925

(United States Bureau of the Census, *Census of Agriculture, 1925*, Nebraska Bulletin, County Tables I and II.)

County	Average acreage per farm	Average value of land per acre	County	Average acreage per farm	Average value of land per acre
Adams	200.7	$77.16	Jefferson	176.7	$83.02
Antelope	242.2	60.38	Johnson	178.4	93.34
Arthur	1,480.8	8.15	Kearney	235.1	71.07
Banner	1,131.6	13.43	Keith	759.9	23.62
Blaine	1,305.8	8.49	Keyapaha	732.6	13.69
Boone	208.6	87.10	Kimball	732.7	19.13
Box Butte	815.2	19.80	Knox	246.5	60.97
Boyd	264.0	49.58	Lancaster	154.3	108.79
Brown	730.9	11.11	Lincoln	542.8	21.34
Buffalo	228.3	61.84	Logan	751.8	14.02
Burt	171.2	129.23	Loup	676.4	13.54
Butler	188.6	122.50	McPherson	1,456.6	9.00
Cass	167.2	129.78	Madison	185.2	105.55
Cedar	199.9	98.12	Merrick	185.1	85.98
Chase	673.9	23.46	Morrill	739.6	17.93
Cherry	2,285.2	7.83	Nance	215.9	85.23
Cheyenne	568.7	27.77	Nemaha	153.8	108.12
Clay	194.0	88.95	Nuckolls	205.6	78.16
Colfax	178.6	134.87	Otoe	168.3	118.23
Cuming	182.2	141.59	Pawnee	187.1	77.97
Custer	383.8	30.01	Perkins	545.6	30.42
Dakota	173.0	107.53	Phelps	256.7	67.49
Dawes	947.7	18.08	Pierce	200.4	78.65
Dawson	308.9	51.98	Platte	187.2	120.48
Deuel	500.3	28.50	Polk	163.4	124.74
Dixon	188.3	92.67	Redwillow	358.2	37.27
Dodge	175.5	131.70	Richardson	164.9	113.72
Douglas	98.1	203.58	Rock	858.9	13.90
Dundy	690.9	20.51	Saline	165.7	111.01
Fillmore	181.1	91.15	Sarpy	134.0	131.66
Franklin	232.4	52.23	Saunders	171.6	133.18
Frontier	430.5	26.07	Scotts Bluff	224.3	54.01
Furnas	263.3	42.60	Seward	156.2	115.12
Gage	181.7	99.12	Sheridan	1,102.5	12.73
Garden	1,420.4	11.17	Sherman	236.2	49.35
Garfield	449.1	15.83	Sioux	1,329.0	8.38
Gosper	307.8	46.29	Stanton	210.7	107.37
Grant	4,634.8	8.52	Thayer	191.6	84.09
Greeley	277.7	49.96	Thomas	1,317.7	7.39
Hall	191.4	84.96	Thurston	204.6	97.83
Hamilton	175.7	107.84	Valley	254.8	55.60
Harlan	253.4	50.81	Washington	147.7	129.65
Hayes	622.5	20.56	Wayne	183.3	120.98
Hitchcock	466.1	28.94	Webster	222.3	59.05
Holt	525.6	25.58	Wheeler	584.5	19.82
Hooker	1,478.3	6.57	York	166.7	110.39
Howard	207.9	61.89			

TABLE 47

PER CENT NEGRO AND PER CENT ILLITERATE IN THE SOUTH ATLANTIC, EAST SOUTH CENTRAL, AND WEST SOUTH CENTRAL DIVISIONS OF THE UNITED STATES, 1920

(United States Bureau of the Census, *Abstract of the Fourteenth Census, 1920*, pages 100 and 432.)

State	Per cent negro	Per cent illiterate
Delaware	13.6	5.9
Maryland	16.9	5.6
Virginia	29.9	11.2
West Virginia	5.9	6.4
North Carolina	29.8	13.1
South Carolina	51.4	18.1
Georgia	41.7	15.3
Florida	34.0	9.6
Kentucky	9.8	8.4
Tennessee	19.3	10.3
Alabama	38.4	16.1
Mississippi	52.2	17.2
Arkansas	27.0	9.4
Louisiana	38.9	21.9
Oklahoma	7.4	3.8
Texas	15.9	8.3

TABLE 48

AVERAGE NUMBER OF WAGE EARNERS AND VALUE ADDED BY MANUFACTURE, FIFTEEN INDUSTRIAL GROUPS, 1925

(United States Bureau of the Census, *Census of Manufactures, 1925*, Mimeographed Press Release.)

Industry	Average number of wage earners	Value added by manufacture
Food and kindred products	664,760	$2,669,858,000
Textiles and their products	1,627,141	3,774,808,000
Iron and steel and their products, not including machinery	851,270	2,727,318,000
Lumber and allied products	921,145	1,963,569,000
Leather and its manufactures	315,288	752,458,000
Rubber products	141,121	536,574,000
Paper, printing, and related industries	536,766	2,529,450,000
Chemicals and allied products	380,595	2,249,616,000
Stone, clay, and glass products	353,036	1,037,225,000
Metals and metal products, other than iron and steel	275,292	886,993,000
Tobacco manufactures	132,132	665,232,000
Machinery, not including transportation equipment	858,843	3,034,914,000
Musical instruments and phonographs	46,980	132,926,000
Transportation equipment, air, land, and water	559,578	2,062,652,000
Railroad repair shops	457,755	769,033,000

TABLE 49

ANNUAL DATA FOR TIME SERIES ANALYSIS

(Data of pig iron and steel ingots from *Statistical Abstract of the United States, 1926*, page 711, and *Survey of Current Business*, No. 78, pages 36, 37; per cent gain in automobile production from *Facts and Figures of the Automobile Industry, 1927*, pages 4, 10, and files of National Automobile Chamber of Commerce; production of potatoes from *Yearbook of Agriculture, 1926*, page 933, *1921*, page 583, and *Survey of Current Business*, No. 78, page 87; production of buckwheat from *Yearbook of Agriculture, 1926*, page 890, and *Crops and Markets*, December, 1927, page 457; wholesale value of passenger automobiles from *Facts and Figures of the Automobile Industry, 1927*, page 5, and files of National Automobile Chamber of Commerce.)

Year	Pig iron production (thousands of long tons)	Production of steel ingots and castings (thousands of long tons)	Per cent gain over previous year in car and truck production	Production of potatoes (thousands of bushels)	Production of buckwheat (thousands of bushels)	Wholesale value of passenger automobiles (millions)
1902.....	17,821	14,947	29			
1903.....	18,009	14,535	25			
1904.....	16,497	13,860	100			
1905.....	22,992	20,024	11	278,885		
1906.....	25,307	23,398	36	331,685		
1907.....	25,781	23,363	30	322,954		
1908.....	15,936	14,023	48	302,000		
1909.....	25,795	23,955	100	394,553		
1910.....	27,304	26,095	43	349,032		
1911.....	23,650	23,676	12	292,737		
1912.....	29,727	31,251	82	420,647		
1913.....	30,966	31,301	28	331,525		
1914.....	23,332	23,513	18	409,921	16,881	
1915.....	29,916	32,151	70	359,721	15,056	$576
1916.....	39,435	42,774	67	286,953	11,662	921
1917.....	38,621	45,061	15	442,108	16,022	1,054
1918.....	39,055	44,462	−38	411,860	16,905	802
1919.....	31,015	34,671	65	322,867	14,399	1,462
1920.....	36,926	42,133	15	403,296	13,142	1,809
1921.....	16,688	19,784	−28	361,659	14,207	1,042
1922.....	27,220	35,603	60	453,396	14,564	1,504
1923.....	40,361	44,944	55	416,105	13,965	2,205
1924.....	31,406	37,932	−11	421,585	13,357	1,978
1925.....	36,701	45,394	19	323,465	13,994	2,469
1926.....	39,373	48,294	4	356,360	12,676	2,652
1927*.....	36,228	43,044	−21	402,149	16,182	2,167

* Data for 1927 subject to revision.

TABLE 50

ANNUAL DATA FOR TIME SERIES ANALYSIS

(Data of production of beehive and by-product coke from *Statistical Abstract of the United States, 1926*, page 729, and *Survey of Current Business*, No. 79, page 28; average individual deposit in savings banks from *Statistical Abstract of the United States, 1926*, page 255; index number of retail food prices from United States Bureau of Labor Statistics, Bulletin 445, *Retail Prices*, page 6, and *Monthly Labor Review*, March, 1928, page 168; production of passenger automobiles from *Facts and Figures of the Automobile Industry, 1927*, pages 9, 10, and *Survey of Current Business*, No. 78, page 50.)

Year	Production of beehive coke (thousands of short tons)	Production of by-product coke (thousands of short tons)	Average individual deposit in savings banks	Index number of food prices at retail (1913 = 100)	Production of passenger automobiles (thousands)
1913	33,585	12,715	$438.82	100.0	462
1914	23,336	11,220	444.13	102.4	544
1915	27,508	14,073	442.73	101.3	896
1916	35,464	19,069	456.57	113.7	1,526
1917	33,168	22,439	476.70	146.4	1,746
1918	30,481	25,998	480.82	168.3	943
1919	19,043	25,138	516.26	185.9	1,658
1920	20,511	30,834	572.12	203.4	1,906
1921	5,538	19,750	560.44	153.3	1,453
1922	8,573	28,551	572.71	141.6	2,303
1923	19,380	37,598	592.05	146.2	3,590
1924	10,286	33,984	604.05	145.9	3,145
1925	11,355	39,912	619.05	157.4	3,696
1926	12,489	44,377	633.10	160.6	3,765
1927*	7,004	43,903	.....	155.4	2,939

* Data for 1927 subject to revision.

TABLE 51

DEATH RATES FOR SUICIDE, PER 100,000 POPULATION, BY SELECTED AGE PERIODS, TEN ORIGINAL REGISTRATION STATES, 1909–24

(Courtesy, Metropolitan Life Insurance Co., Statistical Bureau.)

Year	10–19 years of age	20–29 years of age	30–59 years of age	60 years of age and over
1909	3.6	14.4	25.7	37.7
1910	3.5	14.8	24.3	37.4
1911	3.6	14.9	25.6	35.3
1912	2.9	14.4	24.6	36.2
1913	3.6	16.0	23.6	38.2
1914	3.9	14.5	26.6	37.7
1915	3.0	14.9	26.7	40.7
1916	3.2	12.6	23.4	39.2
1917	2.9	13.3	22.5	38.2
1918	2.5	11.0	19.7	32.9
1919	2.3	10.4	19.6	32.3
1920	2.0	9.8	17.2	29.4
1921	2.5	10.6	21.6	33.9
1922	2.3	10.7	19.8	37.1
1923	2.0	10.0	20.5	36.4
1924	2.2	9.8	20.8	36.0

TABLE 52

ANNUAL PRODUCTION OF POTATOES AND DECENNIAL POPULATION ENUMERATIONS, 1870–1926

(United States Department of Agriculture, *Yearbook of Agriculture, 1926*, page 933, and *1920*, page 616, and United States Bureau of the Census, *Fourteenth Census of the United States, 1920*, Vol. I, page 14.)

Year	Production of potatoes (millions of bushels)	Population	Year	Production of potatoes (millions of bushels)	Population
1870	114.8	38,558,371	1899	228.8	
1871	120.5		1900	210.9	75,994,575
1872	113.5		1901	187.6	
1873	106.1		1902	284.6	
1874	106.0		1903	247.1	
1875	166.9		1904	332.8	
1876	124.8		1905	260.7	
1877	170.1		1906	308.0	
1878	124.1		1907	298.3	
1879	181.6		1908	279.0	
1880	167.7	50,155,783	1909	376.5	
1881	109.1		1910	349.0	91,972,266
1882	171.0		1911	292.7	
1883	208.2		1912	420.6	
1884	190.6		1913	331.5	
1885	175.0		1914	409.9	
1886	168.1		1915	359.7	
1887	134.1		1916	287.0	
1888	202.4		1917	442.1	
1889	204.9		1918	411.9	
1890	148.3	62,947,714	1919	322.9	
1891	254.4		1920	403.3	105,710,620
1892	156.7		1921	361.7	
1893	183.0		1922	453.4	
1894	170.8		1923	416.1	
1895	297.2		1924	421.6	
1896	252.2		1925	323.5	
1897	164.0		1926	356.4	117,136,000*
1898	192.3				

* Estimate of United States Bureau of the Census.

TABLE 53

MONTHLY DISAPPEARANCE INTO TRADE ("CONSUMPTION") OF BUTTER IN THE UNITED STATES, 1917–27

Unit, 1000 pounds

(United States Department of Commerce, *Survey of Current Business*, No. 52, page 21, and files of Bureau of the Census.)

Month	1917	1918	1919	1920	1921	1922
January	113,449	108,540	98,853	103,830	118,793	125,824
February	103,002	89,522	93,511	96,882	108,397	114,948
March	118,331	96,887	111,362	108,363	126,575	134,488
April	126,293	113,123	115,567	121,277	139,511	138,617
May	167,464	158,741	161,573	155,916	175,366	190,141
June	174,582	158,326	148,898	164,201	173,176	175,053
July	161,394	141,098	153,579	148,557	166,677	170,247
August	156,273	145,589	146,659	147,110	167,613	167,365
September	151,301	143,071	136,601	137,956	146,475	158,980
October	132,780	121,727	131,870	129,568	146,782	152,601
November	119,207	100,783	115,998	120,211	124,883	133,983
December	133,227	108,146	107,657	119,719	131,485	133,806

Month	1923	1924	1925	1926	1927 *
January	133,001	142,949	145,698	150,831	145,906
February	116,821	130,846	132,681	142,376	135,997
March	135,855	140,809	154,092	162,567	154,276
April	148,133	154,822	162,693	167,774	165,822
May	184,706	191,908	205,113	209,740	149,660
June	186,512	187,201	194,441	200,465	196,213
July	181,754	176,275	187,297	186,860	178,952
August	182,195	175,439	181,053	188,701	186,123
September	161,127	167,540	175,210	180,718	179,871
October	155,672	161,158	170,590	173,152	178,353
November	141,285	148,757	144,542	163,267	159,106
December	139,709	156,398	152,893	161,699	163,244

* Data for 1927 subject to revision.

TABLE 54

MONTHLY PIG IRON PRODUCTION IN THE UNITED STATES, 1907–27

Unit, 1000 long tons

(Data for 1907–12 from Harvard Committee on Economic Research, *Review of Economic Statistics*, Preliminary Vol. I, page 66; data for 1913–26 from United States Department of Commerce, *Survey of Current Business*, No. 42, page 44; No. 54, page 37; No. 72, page 35; and No. 78, page 36.)

Month	1907	1908	1909	1910	1911	1912	1913
January	2205	1045	1801	2608	1759	2057	2795
February	2045	1077	1703	2397	1794	2100	2586
March	2226	1228	1832	2617	2188	2405	2764
April	2216	1149	1738	2483	2065	2375	2753
May	2295	1165	1880	2390	1893	2512	2822
June	2234	1092	1929	2265	1787	2440	2629
July	2255	1218	2101	2148	1793	2410	2561
August	2250	1348	2246	2106	1926	2512	2544
September	2183	1418	2385	2056	1977	2463	2506
October	2336	1563	2600	2093	2102	2689	2546
November	1828	1577	2547	1909	1999	2630	2233
December	1234	1740	2635	1777	2043	2782	1984

Month	1914	1915	1916	1917	1918	1919	1920
January	1885	1601	3185	3151	2412	3302	3015
February	1889	1675	3087	2645	2319	2940	2979
March	2348	2064	3338	3251	3213	3090	3376
April	2270	2116	3228	3335	3288	2478	2740
May	2093	2263	3361	3417	3446	2188	2986
June	1918	2381	3212	3270	3324	2115	3044
July	1958	2563	3225	3342	3421	2429	3067
August	1995	2780	3204	3248	3390	2743	3147
September	1883	2853	3202	3134	3418	2488	3129
October	1778	3125	3509	3303	3487	1864	3293
November	1518	3037	3312	3206	3354	2392	2935
December	1516	3203	3179	2883	3434	2633	2704

Month	1921	1922	1923	1924	1925	1926	1927 *
January	2416	1645	3230	3019	3370	3316	3104
February	1937	1630	2994	3075	3214	2923	2941
March	1596	2036	3524	3466	3564	3442	3483
April	1193	2072	3550	3233	3259	3450	3422
May	1221	2307	3868	2615	2931	3481	3391
June	1065	2361	3676	2026	2673	3235	3090
July	865	2405	3678	1785	2664	3223	2951
August	954	1816	3449	1887	2704	3200	2947
September	986	2034	3126	2053	2726	3136	2775
October	1247	2638	3149	2477	3023	3334	2784
November	1415	2850	2894	2510	3023	3237	2648
December	1649	3087	2921	2962	3250	3091	2696

* Data for 1927 subject to revision.

TABLE 55

MONTHLY PRODUCTION OF PASSENGER CARS AND TRUCKS IN THE UNITED STATES, 1913–27

(National Automobile Chamber of Commerce, *Facts and Figures of the Automobile Industry, 1927*, pages 9, 10, and *Survey of Current Business*, No. 78, page 50.)

Month	1913	1914	1915	1916	1917
January	35,662	45,644	31,253	107,402	122,002
February	35,663	48,482	49,309	124,546	144,674
March	45,273	60,211	94,311	162,074	165,622
April	60,335	70,367	101,910	152,529	172,045
May	57,199	56,354	88,390	155,950	185,721
June	53,581	44,975	91,059	139,794	172,656
July	34,808	30,987	65,604	120,755	164,764
August	31,416	48,373	82,082	106,623	146,454
September	29,860	53,523	98,861	140,281	162,883
October	28,537	44,264	89,127	134,393	165,333
November	32,376	32,698	84,769	140,255	156,716
December	40,390	33,176	93,255	133,106	115,079

Month	1918	1919	1920	1921	1922
January	92,208	93,779	187,937	53,237	89,374
February	106,962	114,598	188,030	70,599	117,871
March	132,142	146,091	229,212	112,453	171,487
April	153,673	165,229	173,398	152,201	219,394
May	143,003	176,484	210,019	156,805	255,622
June	118,859	166,575	225,677	190,520	278,876
July	118,060	164,831	209,652	176,336	245,755
August	89,542	165,414	205,205	180,781	270,838
September	59,555	180,786	188,514	158,314	203,927
October	50,311	207,222	165,298	147,544	232,824
November	43,244	190,321	134,975	116,051	232,923
December	63,127	162,265	109,432	78,995	225,285

Month	1923	1924	1925	1926	1927*
January	239,302	312,282	230,887	309,544	238,926
February	271,601	361,762	274,373	364,180	304,758
March	351,426	375,355	362,116	434,470	394,430
April	371,460	367,014	421,993	441,307	404,743
May	385,525	303,699	406,259	421,184	404,099
June	371,301	241,817	386,887	387,900	321,959
July	323,815	260,493	387,214	359,275	268,474
August	340,240	276,968	250,574	426,606	308,807
September	321,819	287,356	319,770	395,687	260,420
October	358,698	284,983	436,225	334,421	219,712
November	308,225	224,082	364,347	256,301	134,381
December	300,843	199,524	308,711	167,924	133,178

* Data for 1927 subject to revision.

TABLE 56

MONTHLY FREIGHT TON-MILES IN THE UNITED STATES, 1918–27

Unit, 1,000,000 ton-miles

(United States Department of Commerce, *Statistical Abstract of the United States, 1926*, page 388, and *Survey of Current Business*, No. 78, page 103, and No. 79, page 41.)

Month	1918	1919	1920	1921	1922
January	27,620	30,356	34,964	29,784	27,151
February	29,678	25,630	32,958	24,915	28,451
March	37,706	28,813	37,865	26,816	32,941
April	37,993	28,593	28,592	25,591	24,735
May	37,507	32,276	37,892	28,220	27,940
June	37,668	31,881	38,246	28,146	29,062
July	39,347	34,916	40,449	28,402	27,115
August	40,776	36,416	42,734	30,420	30,472
September	39,579	38,678	40,998	30,864	34,334
October	39,842	40,361	42,570	36,672	39,287
November	35,564	32,497	37,349	29,222	38,077
December	33,639	33,353	34,726	25,723	36,271

Month	1923	1924	1925	1926	1927*
January	37,707	34,510	37,026	37,678	39,223
February	32,628	35,982	33,570	35,414	37,250
March	39,222	36,426	35,332	38,675	41,816
April	38,321	31,926	33,571	36,317	37,102
May	39,598	33,915	37,126	39,833	40,113
June	38,001	31,968	35,854	39,237	38,483
July	38,518	33,185	37,944	41,705	38,380
August	40,344	36,457	41,709	43,729	41,973
September	39,461	39,064	41,305	44,328	42,954
October	42,210	43,134	44,054	48,273	45,552
November	38,158	38,067	40,775	43,342	37,228
December	33,427	35,006	37,856	40,096	34,580

* Data for 1927 subject to revision.

TABLE 57

MONTHLY INDEX OF SALES OF 5 AND 10 CENT STORES (5 CHAINS) IN THE UNITED STATES, 1919–27

1919 = 100

(Federal Reserve Board, Mimeographed Release and *Bulletin*, March, 1927, page 192, and March, 1928, page 188.)

Month	1919	1920	1921	1922	1923	1924	1925	1926	1927*
January	69	87	86	94	115	126	151	166	177
February	71	84	93	100	116	140	156	170	191
March	90	112	121	117	162	163	177	199	213
April	93	112	112	134	142	178	195	202	244
May	96	114	112	129	154	174	191	214	224
June	87	111	110	126	164	162	187	204	224
July	88	114	108	126	143	163	183	206	221
August	95	113	116	130	153	172	195	204	237
September	92	113	113	135	151	169	191	211	232
October	109	132	141	155	180	203	237	257	278
November	114	128	133	151	176	199	220	247	265
December	196	219	242	278	331	366	427	466	511

* Data for 1927 subject to revision.

Table 58a

Monthly Unfilled Orders of the United States Steel Corporation, 1911–27

Unit, 1,000,000 long tons

(Standard Statistics Company, *Statistical Bulletin, 1928–29 Biennial Issue*, page 77.)

Month	1911	1912	1913	1914	1915	1916
January	3.11	5.38	7.83	4.61	4.25	7.92
February	3.40	5.45	7.66	5.03	4.35	8.57
March	3.45	5.30	7.47	4.65	4.26	9.33
April	3.22	5.66	6.98	4.28	4.16	9.83
May	3.11	5.75	6.32	4.00	4.26	9.94
June	3.36	5.81	5.81	4.03	4.68	9.64
July	3.58	5.96	5.40	4.16	4.93	9.59
August	3.70	6.16	5.22	4.21	4.91	9.66
September	3.61	6.55	5.00	3.79	5.32	9.52
October	3.69	7.59	4.51	3.46	6.17	10.02
November	4.14	7.85	4.40	3.32	7.19	11.06
December	5.08	7.93	4.28	3.84	7.81	11.55

Month	1917	1918	1919	1920	1921	1922
January	11.47	9.48	6.68	9.29	7.57	4.24
February	11.58	9.29	6.61	9.50	6.93	4.14
March	11.71	9.06	5.43	9.98	6.24	4.49
April	12.18	8.74	4.80	10.36	5.85	5.10
May	11.89	8.34	4.28	10.94	5.48	5.25
June	11.38	8.02	4.89	10.98	5.12	5.64
July	10.84	8.83	5.58	11.12	4.83	5.78
August	10.41	9.76	6.11	10.81	4.53	5.95
September	9.83	8.30	6.28	10.38	4.56	6.69
October	9.01	8.35	6.47	9.84	4.29	6.90
November	8.90	8.12	7.13	9.02	4.25	6.84
December	9.38	7.38	8.27	8.15	4.24	6.75

Month	1923	1924	1925	1926	1927
January	6.91	4.80	5.04	4.88	3.80
February	7.28	4.91	5.28	4.62	3.60
March	7.40	4.78	4.86	4.38	3.55
April	7.29	4.21	4.45	3.87	3.46
May	6.98	3.63	4.05	3.65	3.05
June	6.39	3.26	3.71	3.48	3.05
July	5.91	3.19	3.54	3.60	3.14
August	5.42	3.29	3.51	3.54	3.20
September	5.04	3.47	3.72	3.59	3.15
October	4.67	3.53	4.11	3.68	3.34
November	4.37	4.03	4.58	3.81	3.45
December	4.45	4.82	5.03	3.96	3.97

Table 58b

Monthly Interest Rate on 4–6 Months Commercial Paper,* 1918–27

(Standard Statistics Company, *Statistical Bulletin, 1928–1929 Biennial Issue*, page 12.)

Month	1918	1919	1920	1921	1922
January	5.58	5.19	6.00	7.83	4.88
February	5.69	5.19	6.41	7.75	4.88
March	5.88	5.38	6.68	7.63	4.78
April	5.90	5.38	6.81	7.55	4.60
May	5.88	5.38	7.16	6.88	4.25
June	5.88	5.53	7.72	6.63	4.05
July	5.88	5.42	7.84	6.28	3.94
August	5.94	5.38	8.00	6.00	3.91
September	6.00	5.38	8.00	5.90	4.25
October	6.00	5.38	8.00	5.65	4.38
November	5.97	5.50	7.94	5.13	4.63
December	5.86	5.88	7.88	5.13	4.63

Month	1923	1924	1925	1926	1927
January	4.63	4.88	3.63	4.31	4.13
February	4.69	4.78	3.65	4.19	3.88
March	5.00	4.59	3.94	4.28	4.00
April	5.13	4.63	3.95	4.19	4.09
May	5.13	4.23	3.88	4.00	4.13
June	4.88	3.91	3.88	3.88	4.13
July	4.94	3.53	3.93	3.97	4.06
August	5.03	3.23	4.00	4.25	3.90
September	5.16	3.13	4.25	4.43	3.91
October	5.13	3.13	4.44	4.50	4.00
November	5.09	3.28	4.38	4.44	3.94
December	4.98	3.56	4.38	4.38	3.95

* Previous to March, 1924, quotations are for 60–90 day commercial paper. About this time, rates for both maturities were practically identical, with the bulk of business now in the long-term paper.

TABLE 59

NUMBER OF WAGE EARNERS EMPLOYED ON THE 15TH OF EACH MONTH AND MONTH-TO-MONTH FLUCTUATIONS, AS SHOWN BY LINK RELATIVES, FOR THE IRON AND STEEL INDUSTRY AND FOR STEEL WORKS AND ROLLING MILLS, OHIO, 1920, 1921, 1923, AND 1924

(Adapted from Ohio State University Studies, Bureau of Business Research Monograph, No. 7, *Ohio Employment Studies*, 1927, by Ralph J. Watkins, Tables K and S.)

IRON AND STEEL

Months	Number of wage earners				Link relatives			
	1920	1921	1923	1924	1920	1921	1923	1924
January	278,796	184,993	221,850	238,390				
February	273,372	172,593	227,806	243,497	98.1	93.3	102.7	102.1
March	284,009	162,411	240,903	244,067	103.9	94.1	105.7	100.2
April	274,824	154,695	239,038	236,303	96.8	95.2	99.2	96.8
May	260,073	152,142	245,405	219,356	94.6	98.3	102.7	92.8
June	275,016	145,447	249,272	193,284	105.7	95.6	101.6	88.1
July	277,535	128,310	243,668	192,901	100.9	88.2	97.8	99.8
August	273,682	135,411	246,646	196,660	98.6	105.5	101.2	101.9
September	279,608	137,489	240,146	199,627	102.2	101.5	97.4	101.5
October	269,161	142,958	238,252	203,280	96.3	104.0	99.2	101.8
November	250,121	150,845	234,425	200,524	92.9	105.5	98.4	98.6
December	222,049	147,795	229,022	213,744	88.8	98.0	97.7	106.6

STEEL WORKS AND ROLLING MILLS

Months	Number of wage earners				Link relatives			
	1920	1921	1923	1924	1920	1921	1923	1924
January	74,282	51,264	71,374	84,801				
February	70,734	47,034	71,571	84,114	95.2	91.7	100.3	99.2
March	75,593	41,219	79,462	84,151	106.9	87.6	111.0	100.0
April	69,971	42,087	75,248	80,949	92.6	102.1	94.7	96.2
May	63,117	43,086	79,021	71,136	90.2	102.4	105.0	87.9
June	73,663	41,111	80,111	55,597	116.7	95.4	101.4	78.2
July	74,716	34,677	75,818	60,089	101.4	84.3	94.6	108.1
August	70,373	40,498	79,654	65,716	94.2	116.8	105.1	109.4
September	77,546	42,050	78,454	67,440	110.2	103.8	98.5	102.6
October	76,962	45,444	80,495	69,041	99.2	108.1	102.6	102.4
November	71,962	48,641	79,857	67,142	93.5	107.0	99.2	97.2
December	61,483	45,604	77,581	75,566	85.4	93.8	97.1	112.5

TABLE 60

MONTHLY INDEX OF DOLLAR SALES OF GROCERIES AT WHOLESALE IN THE UNITED STATES, 1919–26

1919 = 100

(Federal Reserve Board, Mimeographed Release and *Bulletin*, March, 1927, page 191.)

Month	1919	1920	1921	1922	1923	1924	1925	1926
January	83	112	73	65	74	80	80	77
February	71	96	72	62	73	77	73	71
March	83	118	84	76	80	80	79	81
April	87	121	74	66	80	79	75	79
May	99	128	74	74	81	81	79	80
June	106	135	77	82	88	83	84	86
July	112	130	77	75	81	83	85	84
August	100	107	82	79	85	83	83	82
September	108	118	81	83	89	93	92	92
October	117	106	85	90	98	100	99	91
November	116	100	79	87	92	89	90	87
December	119	85	69	78	76	83	83	80

TABLE 61

MONTHLY INDEX, WHOLESALE PRICES OF FOOD IN THE UNITED STATES, 1919–26

1913 = 100

(United States Bureau of Labor Statistics, Bulletin 440, *Wholesale Prices, 1890 to 1926*, pages 20, 21.)

Month	1919	1920	1921	1922	1923	1924	1925	1926
January	203.3	231.2	162.3	130.5	140.5	143.2	159.8	156.2
February	194.1	221.7	151.3	134.7	140.8	143.1	156.9	153.2
March	199.1	219.5	151.2	136.7	143.2	140.8	158.9	151.4
April	205.3	238.2	144.0	136.7	144.2	137.1	154.0	153.2
May	209.8	247.9	139.2	138.2	144.5	136.6	153.2	153.8
June	203.9	243.3	137.2	140.4	142.0	135.6	155.3	156.6
July	209.8	238.1	140.7	141.8	141.3	138.7	157.3	153.6
August	213.6	221.1	145.7	138.3	141.6	144.0	159.2	150.8
September	204.9	215.4	142.3	137.9	147.3	147.7	160.3	152.0
October	204.8	201.0	140.3	140.0	148.5	151.6	157.6	152.0
November	209.9	190.3	138.5	143.0	148.0	153.8	160.2	151.1
December	219.9	170.1	135.7	144.6	146.9	157.9	157.1	151.0

TABLE 62

MOTOR VEHICLE REGISTRATIONS BY STATES, 1917–27

(*Automotive Industries*, February 18, 1928, page 243.)

State	1917	1918	1919	1920	1921
United States	4,970,671	6,105,588	7,596,503	9,206,141	10,505,630
Alabama	32,873	46,171	58,898	74,637	82,343
Arizona	19,890	23,905	28,979	34,559	35,049
Arkansas	28,693	41,458	49,450	59,082	67,446
California	306,916	364,800	477,450	568,892	673,830
Colorado	66,850	83,244	104,865	127,549	145,739
Connecticut	85,724	92,605	109,651	119,134	137,526
Delaware	10,700	12,955	16,152	18,300	21,413
District of Columbia	15,493	30,490	35,400	39,712	61,745
Florida	27,000	54,186	55,400	73,914	97,837
Georgia	70,357	99,800	127,326	144,422	131,942
Idaho	24,768	32,289	42,220	50,873	51,264
Illinois	340,292	389,620	478,438	568,759	670,434
Indiana	192,192	227,160	277,255	332,707	400,342
Iowa	254,317	278,313	363,857	437,300	460,528
Kansas	159,343	189,163	227,752	265,396	291,309
Kentucky	47,416	65,870	90,641	112,685	126,371
Louisiana	28,394	40,000	51,000	66,000	80,500
Maine	41,499	40,372	53,425	62,907	77,527
Maryland	60,943	74,666	95,634	116,341	140,572
Massachusetts	174,274	193,497	247,183	304,631	360,732
Michigan	226,693	262,125	325,813	412,717	477,037
Minnesota	54,009	204,458	259,743	309,569	328,700
Mississippi	36,600	48,400	45,030	63,484	65,139
Missouri	147,528	188,040	244,363	296,919	346,437
Montana	42,696	51,037	59,325	60,646	58,785
Nebraska	148,101	175,409	192,000	223,000	238,704
Nevada	7,160	8,159	9,305	10,464	10,819
New Hampshire	22,267	24,817	31,625	34,680	42,039
New Jersey	134,964	155,519	190,873	227,737	272,994
New Mexico	8,457	15,000	18,077	22,109	24,703
New York	411,567	463,758	571,662	669,290	812,031
North Carolina	55,950	72,313	109,017	140,860	148,684
North Dakota	62,993	71,627	82,885	90,840	92,644
Ohio	346,772	412,775	511,031	615,397	720,632
Oklahoma	100,199	121,500	144,500	204,300	221,300
Oregon	48,632	63,324	83,332	103,790	118,325
Pennsylvania	325,153	394,186	482,117	570,164	689,589
Rhode Island	37,046	36,218	44,833	50,375	54,957
South Carolina	38,322	55,492	70,143	93,843	90,546
South Dakota	67,158	90,521	104,628	120,395	119,274
Tennessee	48,000	63,000	80,422	101,852	117,025
Texas	213,334	251,118	331,310	427,693	467,616
Utah	24,076	32,273	35,236	42,578	47,523
Vermont	20,369	22,655	26,807	31,625	36,965
Virginia	55,000	72,228	94,120	134,000	141,000
Washington	91,337	117,278	148,775	173,920	185,359
West Virginia	31,300	38,750	50,203	78,862	93,894
Wisconsin	164,531	196,844	236,981	293,298	341,841
Wyoming	12,523	16,200	21,371	23,926	26,619

Table continued on next page.

TABLE 62 — *continued*

State	1922	1923	1924	1925	1926	1927
United States	12,299,770	15,312,658	17,605,495	19,857,915	22,046,957	23,253,882
Alabama	90,052	126,642	157,262	194,580	225,651	243,539
Arizona	38,034	48,741	57,828	68,029	73,574	74,527
Arkansas	86,425	111,946	141,983	183,764	209,419	206,568
California	861,805	1,100,283	1,321,480	1,439,463	1,600,475	1,699,955
Colorado	162,328	189,356	213,247	240,097	252,787	268,026
Connecticut	154,675	177,931	214,318	248,474	260,911	282,892
Delaware	24,560	29,977	35,136	40,681	44,418	46,707
District of Columbia	85,425	103,171	80,720	93,612	129,792	126,136
Florida	115,891	160,000	194,196	260,720	416,930	391,168
Georgia	145,584	173,794	209,300	244,871	274,037	296,567
Idaho	53,874	62,379	69,225	81,484	95,861	103,000
Illinois	786,190	969,331	1,123,724	1,263,177	1,370,503	1,438,985
Indiana	469,939	353,342	650,219	725,410	772,215	813,496
Iowa	500,148	576,398	620,906	657,567	689,036	706,829
Kansas	327,194	375,594	410,891	457,033	491,296	501,901
Kentucky	154,021	198,347	231,784	260,754	278,337	285,099
Louisiana	102,284	138,500	178,000	207,000	239,500	255,000
Maine	92,539	108,609	127,178	140,134	150,916	164,250
Maryland	165,624	209,938	195,581	230,684	249,056	284,267
Massachusetts	385,231	566,150	572,315	654,338	689,593	696,107
Michigan	578,980	730,658	868,587	990,709	1,118,785	1,156,344
Minnesota	380,557	448,187	502,987	569,694	624,478	640,102
Mississippi	77,001	104,400	134,547	177,262	210,500	227,103
Missouri	392,969	476,373	544,635	602,900	651,350	678,564
Montana	62,649	73,828	79,695	94,656	103,946	112,756
Nebraska	256,654	286,053	308,713	338,718	367,838	373,912
Nevada	12,647	15,700	18,387	21,185	24,014	25,851
New Hampshire	48,293	59,571	71,929	81,250	89,001	96,000
New Jersey	341,626	430,958	504,190	579,886	650,891	712,402
New Mexico	25,473	31,737	41,750	49,101	54,341	60,000
New York	1,002,293	1,214,642	1,412,879	1,613,141	1,815,437	1,900,866
North Carolina	182,550	247,612	305,756	351,767	385,763	422,544
North Dakota	99,052	109,244	117,061	144,956	157,822	160,696
Ohio	859,504	1,068,700	1,244,000	1,305,000	1,510,000	1,570,418
Oklahoma	249,659	307,000	342,982	438,000	510,000	644,450
Oregon	134,299	166,412	192,629	216,324	234,134	246,623
Pennsylvania	829,737	1,064,624	1,228,586	1,317,053	1,463,261	1,568,617
Rhode Island	66,466	85,480	90,652	102,476	109,145	119,335
South Carolina	95,978	128,656	163,382	170,658	180,967	199,794
South Dakota	125,238	131,720	142,280	168,118	168,230	170,592
Tennessee	135,716	173,365	204,680	248,021	279,639	295,530
Texas	526,238	688,899	834,040	968,406	1,047,202	1,110,986
Utah	49,156	66,025	69,227	72,490	81,633	78,976
Vermont	43,881	52,776	61,179	69,576	73,871	79,510
Virginia	169,000	219,092	261,643	281,100	320,367	335,275
Washington	220,957	261,224	294,812	332,442	367,093	389,409
West Virginia	112,763	162,191	190,134	217,069	221,001	241,042
Wisconsin	388,044	457,271	525,221	596,373	662,328	698,944
Wyoming	30,637	39,831	43,639	47,712	49,633	52,222

TABLE 63

AVERAGE WEEKLY EARNINGS OF SHOP AND OFFICE EMPLOYEES IN REPRESENTATIVE NEW YORK STATE FACTORIES, JUNE, 1914–DECEMBER, 1927

(New York State Department of Labor, *The Industrial Bulletin*, March, 1928, page 182.)

Month	1914	1915	1916	1917	1918	1919	1920
January		$12.44	$13.53	$15.28	$16.81	$23.03	$26.52
February		12.41	13.77	15.31	17.66	22.07	26.47
March		12.65	13.96	15.79	18.71	22.20	27.87
April		12.54	14.15	15.50	19.25	22.11	27.80
May		12.74	14.24	16.08	19.91	22.23	28.45
June	$12.70	12.81	14.41	16.20	20.44	22.51	28.77
July	12.54	12.66	14.11	16.17	20.78	23.10	28.49
August	12.53	12.89	14.44	16.44	21.23	23.85	28.71
September	12.48	12.86	14.87	16.97	22.31	24.83	28.73
October	12.26	13.30	14.95	17.33	22.34	24.41	28.93
November	12.32	13.45	15.16	17.69	21.60	25.37	28.70
December	12.56	13.49	15.51	17.71	23.18	26.32	28.35
Average for year	$12.48	$12.85	$14.43	$16.37	$20.35	$23.50	$28.15

Month	1921	1922	1923	1924	1925	1926	1927
January	$27.61	$24.43	$26.21	$27.81	$28.30	$29.05	$29.52
February	26.77	24.17	25.87	27.73	27.96	28.61	29.39
March	26.97	24.57	26.92	28.16	28.45	29.04	29.78
April	26.20	24.15	27.00	27.70	27.67	28.85	29.17
May	25.86	24.59	27.63	27.56	28.07	28.69	29.18
June	25.71	24.91	27.87	27.21	27.94	28.99	29.17
July	25.26	24.77	27.54	27.06	27.98	28.81	28.95
August	25.43	25.10	27.12	27.40	28.16	28.86	29.29
September	25.07	25.71	27.41	28.05	28.33	29.31	29.57
October	24.53	25.61	27.72	27.53	28.57	29.35	29.28
November	24.32	26.04	27.64	27.66	28.67	29.15	28.75
December	24.91	26.39	27.98	28.25	29.05	29.47	29.57
Average for year	$25.72	$25.04	$27.24	$27.68	$28.26	$29.02	$29.30

Note: The average weekly earnings are obtained by dividing the total weekly payroll by the total number of employees on the payroll for the given week. Reports cover the week including the 15th of the month.

TABLE 64

NUMBER OF ESTABLISHMENTS AND VALUE OF THEIR PRODUCTS, BY SPECIFIED VALUE CLASSES, ALL INDUSTRIES AND BREAD AND BAKERY PRODUCTS, UNITED STATES, 1919

(*Abstract of the Census of Manufactures, 1919*, pages 356, 357.)

Value of products (classes)	All industries		Bread and bakery products	
	Number of establishments	Value of products (000 omitted)	Number of establishments	Value of products (000 omitted)
Less than $5,000	65,485	$167,085	3,107	$9,220
$5,000 to 20,000	87,440	945,603	11,848	136,299
20,000 to 100,000	77,911	3,571,283	8,734	339,746
100,000 to 500,000	39,647	8,965,872	1,091	219,689
500,000 to 1,000,000	9,208	6,467,132	175	123,871
1,000,000 and over	10,414	42,301,104	140	323,071
Total	290,105	$62,418,079	25,095	$1,151,896

TABLE 65

INFANT DEATH RATES PER 1000 BIRTHS, 1924, FOR SELECTED CITIES OF OVER 100,000 POPULATION

(United States Bureau of the Census, *Birth, Stillbirth, and Infant Mortality Statistics, 1924*, page 32.)

City	White	Colored
Baltimore	76	124
Boston	74	97
Chicago	73	126
Cincinnati	73	124
Cleveland	63	107
Detroit	76	118
Louisville	67	99
New York	66	106
Philadelphia	68	131
Pittsburgh	86	151
Richmond	69	124
Washington, D.C.	62	108

TABLE 66

PER CENT OF CHANGE IN AMOUNT OF PAY ROLL, APRIL TO MAY, 1927, TWELVE GROUPS OF MANUFACTURING INDUSTRIES, UNITED STATES

(United States Bureau of Labor Statistics, *Monthly Labor Review*, July, 1927, page 123.)

Industrial group	Per cent of change April to May, 1927
Food and kindred products	+3.0
Textiles and their products	−2.1
Iron and steel and their products	−3.0
Lumber and its products	+3.6
Leather and its products	−2.9
Paper and printing	−0.4
Chemicals and allied products	−8.5
Stone, clay, and glass products	+2.0
Metal products, other than iron and steel	+4.2
Tobacco products	+7.1
Vehicles for land transportation	+1.2
Miscellaneous industries	−3.5
All industries	−1.0

TABLE 67

PROPORTIONS OF TOTAL INCOME OF 2886 FARMERS' FAMILIES, USED FOR FOOD, CLOTHING, RENT, AND ALL OTHER EXPENSES, BY INCOME GROUPS, SELECTED LOCALITIES, 1922–24

(Adapted from United States Department of Agriculture, Department Bulletin 1466, *The Farmer's Standard of Living*, page 34.)

Income group	Number of families	Proportion used for —				
		Food	Clothing	Rent	All other	Total
Below $600	58	54.4	11.6	12.5	21.5	100.0
$600– 899	280	52.1	11.9	11.6	24.4	100.0
900– 1199	579	47.6	12.6	13.0	26.8	100.0
1200– 1499	614	45.3	13.8	12.7	28.2	100.0
1500– 1799	492	43.0	15.1	12.2	29.7	100.0
1800– 2099	332	39.8	15.4	13.5	31.3	100.0
2100– 2399	196	37.2	15.8	12.6	34.4	100.0
2400– 2699	116	36.2	15.5	12.3	36.0	100.0
2700– 2999	83	33.6	16.0	13.1	37.3	100.0
3000 and over	136	30.7	16.4	10.9	42.0	100.0
Total	2,886	..	..	..	..	..
Average for all families	..	41.2	14.7	12.5	31.6	100.0

APPENDICES

APPENDIX A

PROCEDURE FOR DETERMINATION OF THE THEORETICAL FREQUENCIES OF A NORMAL CURVE OF ERROR AND FOR TESTING THE GOODNESS OF FIT

Determination of Theoretical Frequencies. Several practical applications growing out of the determination of the theoretical frequencies of a frequency distribution amenable to the fit of a normal curve of error have been suggested in Exercises 58–62. Other suggestions of uses to which this technique may be applied are indicated in Elderton, *Frequency Curves and Correlation* (first edition), pp. 87–90, and in Pearson, *Tables for Statisticians and Biometricians*, pp. xxxi–xxxiii.

Table I gives the original data for which the theoretical frequencies, as dictated by a fit of the normal curve of error, are to be ascertained. A convenient tabular arrangement for the determination of the theoretical frequencies of the distribution is given in Table II. The procedure may be described as follows: [1]

(1) If the sum of the frequencies be large it is necessary to move the decimal point to the left in order that the total number of items may be somewhere in the general neighborhood of 1000. This in no way affects the fit or the theoretical frequencies, but is essential if the χ^2 test of goodness of fit (described below) is to be applied. Both Elderton and Pearson, cited above, make use of this device, the former dividing by 1000 and the latter by 10. For the problem in hand the frequencies have been divided by 10.

(2) In column 1 list the class intervals of the distribution.

(3) In column 2a list the *lower limits* of each of the class intervals which are below the mean in value and of the class interval in which the mean falls.

(4) In column 2b list the *upper limits* of each of the class intervals which are above the mean in value and of the class interval in which the mean fal's.

(5) In column 3 subtract the value of the mean from each of the limits listed in columns 2a and 2b (x = limit − mean). This shows the deviations from the mean to the group limits in terms of the original units of the problem (centimeters).

(6) In column 4 divide each x value by the value of σ. The deviations from the mean to the limits of the classes are thus expressed in terms of σ.

(7) From Appendix D, ascertain the theoretical frequencies in 10,000 included between the mean and each distance of $\frac{x}{\sigma}$ from the mean. Enter these frequencies in column 5. Note that these are cumulative frequencies included between the mean and the limits of successive groups and that from the mean to each extreme of the distribution 5000 frequencies occur.

(8) In column 6, combine the frequencies of the two parts of the class interval in which the mean falls and, by subtracting the successive cumulative frequencies, determine the number of cases for each of the remaining class intervals. The total of this column should be 10,000, and the theoretical frequencies here

[1] See also Elderton, *Frequency Curves and Correlation* (first edition), p. 89.

shown are those that would be expceted to obtain if the total number of cases were 10,000.

(9) As indicated by the frequencies of column 6, show in column 7, the theoretical distribution of frequencies to be expected when the total is 2859.5. For the first group, for example, 4 : 10,000 :: 1.1 : 2859.5. The total of column 7 should agree very closely with the total number of frequencies in the original problem. In this instance, due to approximations from considering the influence of the second decimal, the total of column 7 is 2859.6, while the total of the original data is 2859.5.

TABLE I

HEIGHTS OF 28,595 AMERICAN SOLDIERS AT DEMOBILIZATION

(*The Medical Department of the United States Army in the World War*, Vol. XV, Part I, page 116.)

Height in centimeters (mid-values)	Number of soldiers
149.....	7
151.....	31
153.....	86
155.....	222
157.....	406
159.....	697
161.....	1,251
163.....	1,815
165.....	2,401
167.....	2,826
169.....	3,143
171.....	3,439
173.....	3,129
175.....	2,771
177.....	2,196
179.....	1,596
181.....	1,027
183.....	680
185.....	395
187.....	236
189.....	137
191.....	55
193.....	25
195.....	7
197.....	9
199.....	3
201.....	..
203.....	1
205.....	2
207.....	1
209.....	1
Total....	28,595

Test of goodness of fit. As a test of the goodness of fit, Karl Pearson has suggested a measure termed χ^2. The value of χ^2 is obtained from a comparison of the observed and the theoretical frequencies for each class interval. Thus:

$\chi^2 = \Sigma\frac{(f - f')^2}{f'}$, where f represents the observed frequency for a class interval and f' the corresponding theoretical frequency. Reference to tables (Pearson,

TABLE II

DETERMINATION OF THEORETICAL FREQUENCIES FOR HEIGHTS OF AMERICAN SOLDIERS AT DEMOBILIZATION

M = 170.89 cm. σ = 6.84 cm.

Class intervals (centimeters)	Limits of class intervals		x deviation from mean to limit	$\frac{x}{\sigma}$	Frequencies included between mean and limit (from Appendix D) N = 10,000	Theoretical frequencies in each class interval N = 10,000	Theoretical frequencies in each class interval N = 2859.5
	Lower limits	Upper limits					
(1)	(2a)	(2b)	(3)	(4)	(5)	(6)	(7)
Below 148.....					5000	4	1.1
148 but less than 150....	148		22.89	3.35	4996	8	2.3
150 but less than 152....	150		20.89	3.05	4988	17	4.9
152 but less than 154....	152		18.89	2.76	4971	39	11.2
154 but less than 156....	154		16.89	2.47	4932	78	22.3
156 but less than 158....	156		14.89	2.18	4854	155	44.3
158 but less than 160....	158		12.89	1.88	4699	258	73.8
160 but less than 162....	160		10.89	1.59	4441	409	117.0
162 but less than 164....	162		8.89	1.30	4032	594	169.9
164 but less than 166....	164		6.89	1.01	3438	817	233.6
166 but less than 168....	166		4.89	.71	2621	993	283.9
168 but less than 170....	168		2.89	.42	1628	1,111	317.7
170 but less than 172....	170		.89	.13	517	1,153	329.7
		172	1.11	.16	636		
172 but less than 174....		174	3.11	.45	1736	1,100	314.5
174 but less than 176....		176	5.11	.75	2734	998	285.4
176 but less than 178....		178	7.11	1.04	3508	774	221.3
178 but less than 180....		180	9.11	1.33	4083	575	164.4
180 but less than 182....		182	11.11	1.62	4474	391	111.8
182 but less than 184....		184	13.11	1.92	4726	252	72.1
184 but less than 186....		186	15.11	2.21	4865	139	39.7
186 but less than 188....		188	17.11	2.50	4938	73	20.9
188 but less than 190....		190	19.11	2.79	4974	36	10.3
190 but less than 192....		192	21.11	3.09	4990	16	4.6
192 but less than 194....		194	23.11	3.38	4996	6	1.7
194 but less than 196....		196	25.11	3.67	4999	3	.9
196 but less than 198....		198	27.11	3.96	5000	1	.3
198 but less than 200....		200	29.11	4.26	5000	..	..
200 but less than 202....		202	31.11	4.55	5000	..	..
202 but less than 204....		204	33.11	4.84	5000	..	..
204 but less than 206....		206	35.11	5.13	5000	..	..
206 but less than 208....		208	37.11	5.43	5000	..	..
208 but less than 210....		210	39.11	5.72	5000	..	..
Total.....	..	..	..	..	..	10,000	2859.6

Tables for Statisticians and Biometricians, Table XII) enables χ^2, when considered in conjunction with n', the number of class intervals, to be converted to P, which gives the probability that random sampling would give a fit as bad or worse, if the real distribution be normal.

A requisite condition for the application of the χ^2 test is that the total frequencies of the distribution be not too great. According to Elderton, "If the number of observations be multiplied by t, say, and the deviations $[f - f']$ are also multiplied by t, then the value of χ^2 will be multiplied by the same figure,

and the test will show that the fit is worse. This may seem strange at first, but a little consideration will show that it is reasonable, since a large number of cases will give smoother series than a small number; then, if the results are proportionally the same in two examples having the same theoretical distribution but different total frequencies, it follows that the one with greater frequency is less probable than the one with less frequency." [1] To render the χ^2 test applicable to distributions having very great total frequencies resort may be had to dividing the frequencies by 10, or 100, or even by 1000.[2] In general it seems best that the total frequencies should be in the neighborhood of 1000, however, in the problem under discussion, a total frequency of 28,595 is reduced to 2,859.5 with good results.

In order to avoid the relatively great influence of slight discrepancies between f and f' at the extremes of a distribution, it is advisable to group together the frequencies of several class intervals at each end of the series. This has been done in the following table which indicates the procedure in applying the χ^2 test: [3]

TABLE III

TEST OF GOODNESS OF FIT OF NORMAL CURVE OF ERROR TO HEIGHTS OF AMERICAN SOLDIERS AT DEMOBILIZATION

Class intervals (centimeters)	f	f'	$f-f'$	$(f-f')^2$	$\frac{(f-f')^2}{f'}$
Below 154.....	12.4	19.5	− 7.1	50.41	2.59
154 but less than 156.....	22.2	22.3	− .1	.01	..
156 but less than 158.....	40.6	44.3	− 3.7	13.69	.31
158 but less than 160.....	69.7	73.8	− 4.1	16.81	.23
160 but less than 162.....	125.1	117.0	+ 8.1	65.61	.56
162 but less than 164.....	181.5	169.9	+ 11.6	134.56	.79
164 but less than 166.....	240.1	233.6	+ 6.5	42.25	.18
166 but less than 168.....	282.6	283.9	− 1.3	1.69	.01
168 but less than 170.....	314.3	317.7	− 3.4	11.56	.04
170 but less than 172.....	343.9	329.7	+ 14.2	201.64	.61
172 but less than 174.....	312.9	314.5	− 1.6	2.56	.01
174 but less than 176.....	277.1	285.4	− 8.3	68.89	.24
176 but less than 178.....	219.6	221.3	− 1.7	2.89	.01
178 but less than 180.....	159.6	164.4	− 4.8	23.04	.14
180 but less than 182.....	102.7	111.8	− 9.1	82.81	.74
182 but less than 184.....	68.0	72.1	− 4.1	16.81	.23
184 but less than 186.....	39.5	39.7	− .2	.04	..
186 but less than 188.....	23.6	20.9	+ 2.7	7.29	.35
188 but less than 190.....	13.7	10.3	+ 3.4	11.56	1.12
190 but less than 192.....	5.5	4.6	+ .9	.81	.18
192 and above.....	4.9	2.9	+ 2.0	4.00	2.32
Total.....	2859.5	2859.6	0.0	..	10.66

Here the value of χ^2 is 10.66 and n', the number of class intervals, is 21. Reference to Pearson's table, mentioned above, gives $P = .95$, which indicates that in 95 out of 100 trials, if the real distribution were normal, we might expect a fit as bad or worse due to variations arising from random sampling.

[1] *Frequency Curves and Correlation* (first edition), p. 142.

[2] See *ibid.*, p. 88, and Pearson, *Tables for Statisticians and Biometricians*, p. xxxii.

[3] See also Pearson, *ibid.*, pp. xxxi–xxxiii, and Elderton, *ibid.*, pp. 139–44.

APPENDIX B

THEORETICAL RESULTS OF TOSSING 1 TO 10 COINS

Number of coins	Expression	Fractional probabilities of the occurrence of:										
		0 heads	1 head	2 heads	3 heads	4 heads	5 heads	6 heads	7 heads	8 heads	9 heads	10 heads
1	$\frac{1}{2}+\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$									
2	$(\frac{1}{2}+\frac{1}{2})^2$	$\frac{1}{4}$	$\frac{2}{4}$	$\frac{1}{4}$								
3	$(\frac{1}{2}+\frac{1}{2})^3$	$\frac{1}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{8}$							
4	$(\frac{1}{2}+\frac{1}{2})^4$	$\frac{1}{16}$	$\frac{4}{16}$	$\frac{6}{16}$	$\frac{4}{16}$	$\frac{1}{16}$						
5	$(\frac{1}{2}+\frac{1}{2})^5$	$\frac{1}{32}$	$\frac{5}{32}$	$\frac{10}{32}$	$\frac{10}{32}$	$\frac{5}{32}$	$\frac{1}{32}$					
6	$(\frac{1}{2}+\frac{1}{2})^6$	$\frac{1}{64}$	$\frac{6}{64}$	$\frac{15}{64}$	$\frac{20}{64}$	$\frac{15}{64}$	$\frac{6}{64}$	$\frac{1}{64}$				
7	$(\frac{1}{2}+\frac{1}{2})^7$	$\frac{1}{128}$	$\frac{7}{128}$	$\frac{21}{128}$	$\frac{35}{128}$	$\frac{35}{128}$	$\frac{21}{128}$	$\frac{7}{128}$	$\frac{1}{128}$			
8	$(\frac{1}{2}+\frac{1}{2})^8$	$\frac{1}{256}$	$\frac{8}{256}$	$\frac{28}{256}$	$\frac{56}{256}$	$\frac{70}{256}$	$\frac{56}{256}$	$\frac{28}{256}$	$\frac{8}{256}$	$\frac{1}{256}$		
9	$(\frac{1}{2}+\frac{1}{2})^9$	$\frac{1}{512}$	$\frac{9}{512}$	$\frac{36}{512}$	$\frac{84}{512}$	$\frac{126}{512}$	$\frac{126}{512}$	$\frac{84}{512}$	$\frac{36}{512}$	$\frac{9}{512}$	$\frac{1}{512}$	
10	$(\frac{1}{2}+\frac{1}{2})^{10}$	$\frac{1}{1024}$	$\frac{10}{1024}$	$\frac{45}{1024}$	$\frac{120}{1024}$	$\frac{210}{1024}$	$\frac{252}{1024}$	$\frac{210}{1024}$	$\frac{120}{1024}$	$\frac{45}{1024}$	$\frac{10}{1024}$	$\frac{1}{1024}$

Number of coins	Chances, in 10,000 of the occurrence of:										
	0 heads	1 head	2 heads	3 heads	4 heads	5 heads	6 heads	7 heads	8 heads	9 heads	10 heads
1	5000.	5000.									
2	2500.	5000.	2500.								
3	1250.	3750.	3750.	1250.							
4	625.	2500.	3750.	2500.	625.						
5	312.5	1562.5	3125.0	3125.0	1562.5	312.5					
6	156.25	937.50	2343.75	3125.00	2343.75	937.50	156.25				
7	78.125	546.875	1640.625	2734.375	2734.375	1640.625	546.875	78.125			
8	39.0625	312.5000	1093.7500	2187.5000	2734.3750	2187.5000	1093.7500	312.5000	39.0625		
9	19.53125	175.78125	703.12500	1640.62500	2460.93750	2460.93750	1640.62500	703.12500	175.78125	19.53125	
10	9.765625	97.656250	439.453125	1171.875000	2050.781250	2460.937500	2050.781250	1171.875000	439.453125	97.656250	9.765625

APPENDIX C[1]

Ordinates of the normal probability curve expressed as fractional parts of the mean ordinate y_o. Each ordinate is erected at a given distance from the mean. The height of the ordinate erected at the mean can be computed from,

$$y_o = \frac{N}{\sigma\sqrt{2\pi}} = \frac{N}{2.5066\,\sigma}$$

The corresponding height of any other ordinate can be read from the table by assigning the distance that the ordinate is from the mean (x). Distances on x are measured as fractional parts of σ. Thus the height of an ordinate at a distance from the mean of $.7\,\sigma$ will be $.78270\ y_o$; the height of an ordinate at $2.15\,\sigma$ from the mean will be $.09914\ y_o$, etc.

x/σ	0	1	2	3	4	5	6	7	8	9
0.0	100000	99995	99980	99955	99920	99875	99820	99755	99685	99596
0.1	99501	99396	99283	99158	99025	98881	98728	98565	98393	98211
0.2	98020	97819	97609	97390	97161	96923	96676	96420	96156	95882
0.3	95600	95309	95010	94702	94387	94055	93723	93382	93024	92677
0.4	92312	91399	91558	91169	90774	90371	89961	89543	89119	88688
0.5	88250	87805	87353	86896	86432	85962	85488	85006	84519	84060
0.6	83527	83023	82514	82010	81481	80957	80429	79896	79359	78817
0.7	78270	77721	77167	76610	76048	75484	74916	74342	73769	73193
0.8	72615	72033	71448	70861	70272	69681	69087	68493	67896	67298
0.9	66689	66097	65494	64891	64287	63683	63077	62472	61865	61259
1.0	60653	60047	59440	58834	58228	57623	57017	56414	55810	55209
1.1	54607	54007	53409	52812	52214	51620	51027	50437	49848	49260
1.2	48675	48092	47511	46933	46357	45783	45212	44644	44078	43516
1.3	42956	42399	41845	41294	40747	40202	39661	39123	38569	38058
1.4	37531	37007	36487	35971	35459	34950	34445	33944	33447	32954
1.5	32465	31980	31500	31023	30550	30082	29618	29158	28702	28251
1.6	27804	27361	26923	26489	26059	25634	25213	24797	24385	23978
1.7	23575	23176	22782	22392	22008	21627	21251	20879	20511	20148
1.8	19790	19436	19086	18741	18400	18064	17732	17404	17081	16762
1.9	16448	16137	15831	15530	15232	14939	14650	14364	14083	13806
2.0	13534	13265	13000	12740	12483	12230	11981	11737	11496	11259
2.1	11025	10795	10570	10347	10129	09914	09702	09495	09290	09090
2.2	08892	08698	08507	08320	08136	07956	07778	07604	07433	07265
2.3	07100	06939	06780	06624	06471	06321	06174	06029	05888	05750
2.4	05614	05481	05350	05222	05096	04973	04852	04734	04618	04505
2.5	04394	04285	04179	04074	03972	03873	03775	03680	03586	03494
2.6	03405	03317	03232	03148	03066	02986	02908	02831	02757	02684
2.7	02612	02542	02474	02408	02343	02280	02218	02157	02098	02040
2.8	01984	01929	01876	01823	01772	01723	01674	01627	01581	01536
2.9	01492	01449	01408	01367	01328	01288	01252	01215	01179	01145
3.0	01111	00819	00598	00432	00309	00219	00153	00106	00073	00050
4.0	00034	00022	00015	00010	00006	00004	00003	00002	00001	00001
5.0	00000									

[1] From Rugg's *Statistical Methods Applied to Education*. Reprinted by arrangement with the publishers, Houghton Mifflin Company.

APPENDIX D[1]

Fractional parts of the total area (10,000) under the normal probability curve, corresponding to distances on the baseline between the mean and successive points of division laid off from the mean. Distances are measured in units of the standard deviation, σ. To illustrate, the table is read as follows: between the mean ordinate, y_o, and any ordinate erected at a distance from it of, say, $.8\,\sigma$ $\left(i.e., \frac{x}{\sigma} = .8\right)$, is included 28.81 per cent of the entire area.

x/σ	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	0000	0040	0080	0120	0159	0199	0239	0279	0319	0359
0.1	0398	0438	0478	0517	0557	0596	0636	0675	0714	0753
0.2	0793	0832	0871	0910	0948	0987	1026	1064	1103	1141
0.3	1179	1217	1255	1293	1331	1368	1406	1443	1480	1517
0.4	1554	1591	1628	1664	1700	1736	1772	1808	1844	1879
0.5	1915	1950	1985	2019	2054	2088	2123	2157	2190	2224
0.6	2257	2291	2324	2357	2389	2422	2454	2486	2518	2549
0.7	2580	2612	2642	2673	2704	2734	2764	2794	2823	2852
0.8	2881	2910	2939	2967	2995	3023	3051	3078	3106	3133
0.9	3159	3186	3212	3238	3264	3289	3315	3340	3365	3389
1.0	3413	3438	3461	3485	3508	3531	3554	3577	3599	3621
1.1	3643	3665	3686	3718	3729	3749	3770	3790	3810	3830
1.2	3849	3869	3888	3907	3925	3944	3962	3980	3997	4015
1.3	4032	4049	4066	4083	4099	4115	4131	4147	4162	4177
1.4	4192	4207	4222	4236	4251	4265	4279	4292	4306	4319
1.5	4332	4345	4357	4370	4382	4394	4406	4418	4430	4441
1.6	4452	4463	4474	4485	4495	4505	4515	4525	4535	4545
1.7	4554	4564	4573	4582	4591	4599	4608	4616	4625	4633
1.8	4641	4649	4656	4664	4671	4678	4686	4693	4699	4706
1.9	4713	4719	4726	4732	4738	4744	4750	4758	4762	4767
2.0	4773	4778	4783	4788	4793	4798	4803	4808	4812	4817
2.1	4821	4826	4830	4834	4838	4842	4846	4850	4854	4857
2.2	4861	4865	4868	4871	4875	4878	4881	4884	4887	4890
2.3	4893	4896	4898	4901	4904	4906	4909	4911	4913	4916
2.4	4918	4920	4922	4925	4927	4929	4931	4932	4934	4936
2.5	4938	4940	4941	4943	4945	4946	4948	4949	4951	4952
2.6	4953	4955	4956	4957	4959	4960	4961	4962	4963	4964
2.7	4965	4966	4967	4968	4969	4970	4971	4972	4973	4974
2.8	4974	4975	4976	4977	4977	4978	4979	4980	4980	4981
2.9	4981	4982	4983	4984	4984	4984	4985	4985	4986	4986
3.0	4986.5	4987	4987	4988	4988	4988	4989	4989	4989	4990
3.1	4990.3	4991	4991	4991	4992	4992	4992	4992	4993	4993
3.2	4993.129									
3.3	4995.166									
3.4	4996.631									
3.5	4997.674									
3.6	4998.409									
3.7	4998.922									
3.8	4999.277									
3.9	4999.519									
4.0	4999.683									
4.5	4999.966									
5.0	4999.997133									

[1] From Rugg's *Statistical Methods Applied to Education.*

APPENDIX E[1]

Values of r for corresponding values of ρ computed from the expressions,

$$\rho = 1 - \frac{6 \Sigma D^2}{N(N^2 - 1)}$$

$$r = 2 \sin\left(\frac{\pi}{6}\rho\right)$$

ρ	r	ρ	r	ρ	r	ρ	r
.01	.0105	.26	.2714	.51	.5277	.76	.7750
.02	.0209	.27	.2818	.52	.5378	.77	.7847
.03	.0314	.28	.2922	.53	.5479	.78	.7943
.04	.0419	.29	.3025	.54	.5580	.79	.8039
05	.0524	.30	.3129	.55	.5680	.80	.8135
.06	.0628	.31	.3232	.56	.5781	.81	.8230
.07	.0733	.32	.3335	.57	.5881	.82	.8325
.08	.0838	.33	.3439	.58	.5981	.83	.8421
.09	.0942	.34	.3542	.59	.6081	.84	.8516
.10	.1047	.35	.3645	.60	.6180	.85	.8610
.11	.1151	.36	.3748	.61	.6280	.86	.8705
.12	.1256	.37	.3850	.62	.6379	.87	.8799
.13	.1360	.38	.3935	.63	.6478	.88	.8893
.14	.1465	.39	.4056	.64	.6577	.89	.8986
.15	.1569	.40	.4158	.65	.6676	.90	.9080
.16	.1674	.41	.4261	.66	.6775	.91	.9173
.17	.1778	.42	.4363	.67	.6873	.92	.9269
.18	.1882	.43	.4465	.68	.6971	.93	.9359
.19	.1986	.44	.4567	.69	.7069	.94	.9451
.20	.2091	.45	.4669	.70	.7167	.95	.9543
.21	.2195	.46	.4771	.71	.7265	.96	.9635
.22	.2299	.47	.4872	.72	.7363	.97	.9727
.23	.2403	.48	.4973	.73	.7460	.98	.9818
.24	.2507	.49	.5075	.74	.7557	.99	.9909
.25	.2611	.50	.5176	.75	.7654	1.00	1.0000

[1] From Rugg's *Statistical Methods Applied to Education*.

APPENDIX F

SUMS OF THE SQUARES OF THE FIRST ONE HUNDRED NATURAL NUMBERS

(A table of the sums of the first 7 powers of the first 100 natural numbers may be found in Pearson, *Tables for Statisticians and Biometricians*, pages 40–41. The sums of the first 6 powers of the first 50 natural numbers are shown in Mills and Davenport, *Problems and Tables in Statistics*, page 197.)

n	$\Sigma(n^2)$	n	$\Sigma(n^2)$	n	$\Sigma(n^2)$	n	$\Sigma(n^2)$
1	1	26	6,201	51	45,526	76	149,226
2	5	27	6,930	52	48,230	77	155,155
3	14	28	7,714	53	51,039	78	161,239
4	30	29	8,555	54	53,955	79	167,480
5	55	30	9,455	55	56,980	80	173,880
6	91	31	10,416	56	60,116	81	180,441
7	140	32	11,440	57	63,365	82	187,165
8	204	33	12,529	58	66,729	83	194,054
9	285	34	13,685	59	70,210	84	201,110
10	385	35	14,910	60	73,810	85	208,335
11	506	36	16,206	61	77,531	86	215,731
12	650	37	17,575	62	81,375	87	223,300
13	819	38	19,019	63	85,344	88	231,044
14	1,015	39	20,540	64	89,440	89	238,965
15	1,240	40	22,140	65	93,665	90	247,065
16	1,496	41	23,821	66	98,021	91	255,346
17	1,785	42	25,585	67	102,510	92	263,810
18	2,109	43	27,434	68	107,134	93	272,459
19	2,470	44	29,370	69	111,895	94	281,295
20	2,870	45	31,395	70	116,795	95	290,320
21	3,311	46	33,511	71	121,836	96	299,536
22	3,795	47	35,720	72	127,020	97	308,945
23	4,324	48	38,024	73	132,349	98	318,549
24	4,900	49	40,425	74	137,825	99	328,350
25	5,525	50	42,925	75	143,450	100	338,350

APPENDIX G

SUMS OF THE SQUARES OF THE FIRST ONE HUNDRED ODD NATURAL NUMBERS

(A table of the sums of the first 6 powers of the first 100 odd natural numbers is given in Ross, "Formulæ for Facilitating Computations in Time Series Analyses," *Journal of the American Statistical Association*, March, 1925, pages 75–79. The sums of the first 6 powers of the first 50 odd natural numbers appear in Mills and Davenport, *Problems and Tables in Statistics*, page 198.)

n_o	$\Sigma(n_o^2)$	n_o	$\Sigma(n_o^2)$	n_o	$\Sigma(n_o^2)$	n_o	$\Sigma(n_o^2)$
1	1	26	23,426	51	176,851	76	585,276
2	10	27	26,235	52	187,460	77	608,685
3	35	28	29,260	53	198,485	78	632,710
4	84	29	32,509	54	209,934	79	657,359
5	165	30	35,990	55	221,815	80	682,640
6	286	31	39,711	56	234,136	81	708,561
7	455	32	43,680	57	246,905	82	735,130
8	680	33	47,905	58	260,130	83	762,355
9	969	34	52,394	59	273,819	84	790,244
10	1,330	35	57,155	60	287,980	85	818,805
11	1,771	36	62,196	61	302,621	86	848,046
12	2,300	37	67,525	62	317,750	87	877,975
13	2,925	38	73,150	63	333,375	88	908,600
14	3,654	39	79,079	64	349,504	89	939,929
15	4,495	40	85,320	65	366,145	90	971,970
16	5,456	41	91,881	66	383,306	91	1,004,731
17	6,545	42	98,770	67	400,995	92	1,038,220
18	7,770	43	105,995	68	419,220	93	1,072,445
19	9,139	44	113,554	69	437,989	94	1,107,414
20	10,660	45	121,485	70	457,310	95	1,143,135
21	12,341	46	129,766	71	477,191	96	1,179,616
22	14,190	47	138,415	72	497,640	97	1,216,865
23	16,215	48	147,440	73	518,665	98	1,254,890
24	18,424	49	156,849	74	540,274	99	1,293,699
25	20,825	50	166,650	75	562,475	100	1,333,300

APPENDIX H

SQUARES, SQUARE ROOTS, AND RECIPROCALS, 1 TO 1000

No.	Square	Square Root	Reciprocal
1	1	1.0000000	1.000000000
2	4	1.4142136	0.500000000
3	9	1.7320508	.333333333
4	16	2.0000000	.250000000
5	25	2.2360680	.200000000
6	36	2.4494897	.166666667
7	49	2.6457513	.142857143
8	64	2.8284271	.125000000
9	81	3.0000000	.111111111
10	1 00	3.1622777	.100000000
11	1 21	3.3166248	.090909091
12	1 44	3.4641016	.083333333
13	1 69	3.6055513	.076923077
14	1 96	3.7416574	.071428571
15	2 25	3.8729833	.066666667
16	2 56	4.0000000	.062500000
17	2 89	4.1231056	.058823529
18	3 24	4.2426407	.055555556
19	3 61	4.3588989	.052631579
20	4 00	4.4721360	.050000000
21	4 41	4.5825757	.047619048
22	4 84	4.6904158	.045454545
23	5 29	4.7958315	.043478261
24	5 76	4.8989795	.041666667
25	6 25	5.0000000	.040000000
26	6 76	5.0990195	.038461538
27	7 29	5.1961524	.037037037
28	7 84	5.2915026	.035714286
29	8 41	5.3851648	.034482759
30	9 00	5.4772256	.033333333
31	9 61	5.5677644	.032258065
32	10 24	5.6568542	.031250000
33	10 89	5.7445626	.030303030
34	11 56	5.8309519	.029411765
35	12 25	5.9160798	.028571429
36	12 96	6.0000000	.027777778
37	13 69	6.0827625	.027027027
38	14 44	6.1644140	.026315789
39	15 21	6.2449980	.025641026
40	16 00	6.3245553	.025000000
41	16 81	6.4031242	.024390244
42	17 64	6.4807407	.023809524
43	18 49	6.5574385	.023255814
44	19 36	6.6332496	.022727273
45	20 25	6.7082039	.022222222
46	21 16	6.7823300	.021739130
47	22 09	6.8556546	.021276596
48	23 04	6.9282032	.020833333
49	24 01	7.0000000	.020408163
50	25 00	7.0710678	.020000000

No.	Square	Square Root	Reciprocal
51	26 01	7.1414284	.019607843
52	27 04	7.2111026	.019230769
53	28 09	7.2801099	.018867925
54	29 16	7.3484692	.018518519
55	30 25	7.4161985	.018181818
56	31 36	7.4833148	.017857143
57	32 49	7.5498344	.017543860
58	33 64	7.6157731	.017241379
59	34 81	7.6811457	.016949153
60	36 00	7.7459667	.016666667
61	37 21	7.8102497	.016393443
62	38 44	7.8740079	.016129032
63	39 69	7.9372539	.015873016
64	40 96	8.0000000	.015625000
65	42 25	8.0622577	.015384615
66	43 56	8.1240384	.015151515
67	44 89	8.1853528	.014925373
68	46 24	8.2462113	.014705882
69	47 61	8.3066239	.014492754
70	49 00	8.3666003	.014285714
71	50 41	8.4261498	.014084507
72	51 84	8.4852814	.013888889
73	53 29	8.5440037	.013698630
74	54 76	8.6023253	.013513514
75	56 25	8.6602540	.013333333
76	57 76	8.7177979	.013157895
77	59 29	8.7749644	.012987013
78	60 84	8.8317609	.012820513
79	62 41	8.8881944	.012658228
80	64 00	8.9442719	.012500000
81	65 61	9.0000000	.012345679
82	67 24	9.0553851	.012195122
83	68 89	9.1104336	.012048193
84	70 56	9.1651514	.011904762
85	72 25	9.2195445	.011764706
86	73 96	9.2736185	.011627907
87	75 69	9.3273791	.011494253
88	77 44	9.3808315	.011363636
89	79 21	9.4339811	.011235955
90	81 00	9.4868330	.011111111
91	82 81	9.5393920	.010989011
92	84 64	9.5916630	.010869565
93	86 49	9.6436508	.010752688
94	88 36	9.6953597	.010638298
95	90 25	9.7467943	.010526316
96	92 16	9.7979590	.010416667
97	94 09	9.8488578	.010309278
98	96 04	9.8994949	.010204082
99	98 01	9.9498744	.010101010
100	1 00 00	10.0000000	.010000000

No.	Square	Square Root	Reciprocal .00
101	1 02 01	10.0498756	9900990
102	1 04 04	10.0995049	9803922
103	1 06 09	10.1488916	9708738
104	1 08 16	10.1980390	9615385
105	1 10 25	10.2469508	9523810
106	1 12 36	10.2956301	9433962
107	1 14 49	10.3440804	9345794
108	1 16 64	10.3923048	9259259
109	1 18 81	10.4403065	9174312
110	1 21 00	10.4880885	9090909
111	1 23 21	10.5356538	9009009
112	1 25 44	10.5830052	8928571
113	1 27 69	10.6301458	8849558
114	1 29 96	10.6770783	8771930
115	1 32 25	10.7238053	8695652
116	1 34 56	10.7703296	8620690
117	1 36 89	10.8166538	8547009
118	1 39 24	10.8627805	8474576
119	1 41 61	10.9087121	8403361
120	1 44 00	10.9544512	8333333
121	1 46 41	11.0000000	8264463
122	1 48 84	11.0453610	8196721
123	1 51 29	11.0905365	8130081
124	1 53 76	11.1355287	8064516
125	1 56 25	11.1803399	8000000
126	1 58 76	11.2249722	7936508
127	1 61 29	11.2694277	7874016
128	1 63 84	11.3137085	7812500
129	1 66 41	11.3578167	7751938
130	1 69 00	11.4017543	7692308
131	1 71 61	11.4455231	7633588
132	1 74 24	11.4891253	7575758
133	1 76 89	11.5325626	7518797
134	1 79 56	11.5758369	7462687
135	1 82 25	11.6189500	7407407
136	1 84 96	11.6619038	7352941
137	1 87 69	11.7046999	7299270
138	1 90 44	11.7473401	7246377
139	1 93 21	11.7898261	7194245
140	1 96 00	11.8321596	7142857
141	1 98 81	11.8743422	7092199
142	2 01 64	11.9163753	7042254
143	2 04 49	11.9582607	6993007
144	2 07 36	12.0000000	6944444
145	2 10 25	12.0415946	6896552
146	2 13 16	12.0830460	6849315
147	2 16 09	12.1243557	6802721
148	2 19 04	12.1655251	6756757
149	2 22 01	12.2065556	6711409
150	2 25 00	12.2474487	6666667

No.	Square	Square Root	Reciprocal .00
151	2 28 01	12.2882057	6622517
152	2 31 04	12.3288280	6578947
153	2 34 09	12.3693169	6535948
154	2 37 16	12.4096736	6493506
155	2 40 25	12.4498996	6451613
156	2 43 36	12.4899960	6410256
157	2 46 49	12.5299641	6369427
158	2 49 64	12.5698051	6329114
159	2 52 81	12.6095202	6289308
160	2 56 00	12.6491106	6250000
161	2 59 21	12.6885775	6211180
162	2 62 44	12.7279221	6172840
163	2 65 69	12.7671453	6134969
164	2 68 96	12.8062485	6097561
165	2 72 25	12.8452326	6060606
166	2 75 56	12.8840987	6024096
167	2 78 89	12.9228480	5988024
168	2 82 24	12.9614814	5952381
169	2 85 61	13.0000000	5917160
170	2 89 00	13.0384048	5882353
171	2 92 41	13.0766968	5847953
172	2 95 84	13.1148770	5813953
173	2 99 29	13.1529464	5780347
174	3 02 76	13.1909060	5747126
175	3 06 25	13.2287566	5714286
176	3 09 76	13.2664992	5681818
177	3 13 29	13.3041347	5649718
178	3 16 84	13.3416641	5617978
179	3 20 41	13.3790882	5586592
180	3 24 00	13.4164079	5555556
181	3 27 61	13.4536240	5524862
182	3 31 24	13.4907376	5494505
183	3 34 89	13.5277493	5464481
184	3 38 56	13.5646600	5434783
185	3 42 25	13.6014705	5405405
186	3 45 96	13.6381817	5376344
187	3 49 69	13.6747943	5347594
188	3 53 44	13.7113092	5319149
189	3 57 21	13.7477271	5291005
190	3 61 00	13.7840488	5263158
191	3 64 81	13.8202750	5235602
192	3 68 64	13.8564065	5208333
193	3 72 49	13.8924440	5181347
194	3 76 36	13.9283883	5154639
195	3 80 25	13.9642400	5128205
196	3 84 16	14.0000000	5102041
197	3 88 09	14.0356688	5076142
198	3 92 04	14.0712473	5050505
199	3 96 01	14.1067360	5025126
200	4 00 00	14.1421356	5000000

No.	Square	Square Root	Reciprocal .00
201	4 04 01	14.1774469	4975124
202	4 08 04	14.2126704	4950495
203	4 12 09	14.2478068	4926108
204	4 16 16	14.2828569	4901961
205	4 20 25	14.3178211	4878049
206	4 24 36	14.3527001	4854369
207	4 28 49	14.3874946	4830918
208	4 32 64	14.4222051	4807692
209	4 36 81	14.4568323	4784689
210	4 41 00	14.4913767	4761905
211	4 45 21	14.5258390	4739336
212	4 49 44	14.5602198	4716981
213	4 53 69	14.5945195	4694836
214	4 57 96	14.6287388	4672897
215	4 62 25	14.6628783	4651163
216	4 66 56	14.6969385	4629630
217	4 70 89	14.7309199	4608295
218	4 75 24	14.7648231	4587156
219	4 79 61	14.7986486	4566210
220	4 84 00	14.8323970	4545455
221	4 88 41	14.8660687	4524887
222	4 92 84	14.8996644	4504505
223	4 97 29	14.9331845	4484305
224	5 01 76	14.9666295	4464286
225	5 06 25	15.0000000	4444444
226	5 10 76	15.0332964	4424779
227	5 15 29	15.0665192	4405286
228	5 19 84	15.0996689	4385965
229	5 24 41	15.1327460	4366812
230	5 29 00	15.1657509	4347826
231	5 33 61	15.1986842	4329004
232	5 38 24	15.2315462	4310345
233	5 42 89	15.2643375	4291845
234	5 47 56	15.2970585	4273504
235	5 52 25	15.3297097	4255319
236	5 56 96	15.3622915	4237288
237	5 61 69	15.3948043	4219409
238	5 66 44	15.4272486	4201681
239	5 71 21	15.4596248	4184100
240	5 76 00	15.4919334	4166667
241	5 80 81	15.5241747	4149378
242	5 85 64	15.5563492	4132231
243	5 90 49	15.5884573	4115226
244	5 95 36	15.6204994	4098361
245	6 00 25	15.6524758	4081633
246	6 05 16	15.6843871	4065041
247	6 10 09	15.7162336	4048583
248	6 15 04	15.7480157	4032258
249	6 20 01	15.7797338	4016064
250	6 25 00	15.8113883	4000000

No.	Square	Square Root	Reciprocal .00
251	6 30 01	15.8429795	3984064
252	6 35 04	15.8745079	3968254
253	6 40 09	15.9059737	3952569
254	6 45 16	15.9373775	3937008
255	6 50 25	15.9687194	3921569
256	6 55 36	16.0000000	3906250
257	6 60 49	16.0312195	3891051
258	6 65 64	16.0623784	3875969
259	6 70 81	16.0934769	3861004
260	6 76 00	16.1245155	3846154
261	6 81 21	16.1554944	3831418
262	6 86 44	16.1864141	3816794
263	6 91 69	16.2172747	3802281
264	6 96 96	16.2480768	3787879
265	7 02 25	16.2788206	3773585
266	7 07 56	16.3095064	3759398
267	7 12 89	16.3401346	3745318
268	7 18 24	16.3707055	3731343
269	7 23 61	16.4012195	3717472
270	7 29 00	16.4316767	3703704
271	7 34 41	16.4620776	3690037
272	7 39 84	16.4924225	3676471
273	7 45 29	16.5227116	3663004
274	7 50 76	16.5529454	3649635
275	7 56 25	16.5831240	3636364
276	7 61 76	16.6132477	3623188
277	7 67 29	16.6433170	3610108
278	7 72 84	16.6733320	3597122
279	7 78 41	16.7032931	3584229
280	7 84 00	16.7332005	3571429
281	7 89 61	16.7630546	3558719
282	7 95 24	16.7928556	3546099
283	8 00 89	16.8226038	3533569
284	8 06 56	16.8522995	3521127
285	8 12 25	16.8819430	3508772
286	8 17 96	16.9115345	3496503
287	8 23 69	16.9410743	3484321
288	8 29 44	16.9705627	3472222
289	8 35 21	17.0000000	3460208
290	8 41 00	17.0293864	3448276
291	8 46 81	17.0587221	3436426
292	8 52 64	17.0880075	3424658
293	8 58 49	17.1172428	3412969
294	8 64 36	17.1464282	3401361
295	8 70 25	17.1755640	3589831
296	8 76 16	17.2046505	3378378
297	8 82 09	17.2336879	3367003
298	8 88 04	17.2626765	3355705
299	8 94 01	17.2916165	3344482
300	9 00 00	17.3205081	3333333

No.	Square	Square Root	Reciprocal .00
301	9 06 01	17.3493516	3322259
302	9 12 04	17.3781472	3311258
303	9 18 09	17.4068952	3300330
304	9 24 16	17.4355958	3289474
305	9 30 25	17.4642492	3278689
306	9 36 36	17.4928557	3267974
307	9 42 49	17.5214155	3257329
308	9 48 64	17.5499288	3246753
309	9 54 81	17.5783958	3236246
310	9 61 00	17.6068169	3225806
311	9 67 21	17.6351921	3215434
312	9 73 44	17.6635217	3205128
313	9 79 69	17.6918060	3194888
314	9 85 96	17.7200451	3184713
315	9 92 25	17.7482393	3174603
316	9 98 56	17.7763888	3164557
317	10 04 89	17.8044938	3154574
318	10 11 24	17.8325545	3144654
319	10 17 61	17.8605711	3134796
320	10 24 00	17.8885438	3125000
321	10 30 41	17.9164729	3115265
322	10 36 84	17.9443584	3105590
323	10 43 29	17.9722008	3095975
324	10 49 76	18.0000000	3086420
325	10 56 25	18.0277564	3076923
326	10 62 76	18.0554701	3067485
327	10 69 29	18.0831413	3058104
328	10 75 84	18.1107703	3048780
329	10 82 41	18.1383571	3039514
330	10 89 00	18.1659021	3030303
331	10 95 61	18.1934054	3021148
332	11 02 24	18.2208672	3012048
333	11 08 89	18.2482876	3003003
334	11 15 56	18.2756669	2994012
335	11 22 25	18.3030052	2985075
336	11 28 96	18.3303028	2976190
337	11 35 69	18.3575598	2967359
338	11 42 44	18.3847763	2958580
339	11 49 21	18.4119526	2949853
340	11 56 00	18.4390889	2941176
341	11 62 81	18.4661853	2932551
342	11 69 64	18.4932420	2923977
343	11 76 49	18.5202592	2915452
344	11 83 36	18.5472370	2906977
345	11 90 25	18.5741756	2898551
346	11 97 16	18.6010752	2890173
347	12 04 09	18.6279360	2881844
348	12 11 04	18.6547581	2873563
349	12 18 01	18.6815417	2865330
350	12 25 00	18.7082869	2857143

No.	Square	Square Root	Reciprocal .00
351	12 32 01	18.7349940	2849003
352	12 39 04	18.7616630	2840909
353	12 46 09	18.7882942	2832861
354	12 53 16	18.8148877	2824859
355	12 60 25	18.8414437	2816901
356	12 67 36	18.8679623	2808989
357	12 74 49	18.8944436	2801120
358	12 81 64	18.9208879	2793296
359	12 88 81	18.9472953	2785515
360	12 96 00	18.9736660	2777778
361	13 03 21	19.0000000	2770083
362	13 10 44	19.0262976	2762431
363	13 17 69	19.0525589	2754821
364	13 24 96	19.0787840	2747253
365	13 32 25	19.1049732	2739726
366	13 39 56	19.1311265	2732240
367	13 46 89	19.1572441	2724796
368	13 54 24	19.1833261	2717391
369	13 61 61	19.2093727	2710027
370	13 69 00	19.2353841	2702703
371	13 76 41	19.2613603	2695418
372	13 83 84	19.2873015	2688172
373	13 91 29	19.3132079	2680965
374	13 98 76	19.3390796	2673797
375	14 06 25	19.3649167	2666667
376	14 13 76	19.3907194	2659574
377	14 21 29	19.4164878	2652520
378	14 28 84	19.4422221	2645503
379	14 36 41	19.4679223	2638522
380	14 44 00	19.4935887	2631579
381	14 51 61	19.5192213	2624672
382	14 59 24	19.5448203	2617801
383	14 66 89	19.5703858	2610966
384	14 74 56	19.5959179	2604167
385	14 82 25	19.6214169	2597403
386	14 89 96	19.6468827	2590674
387	14 97 69	19.6723156	2583979
388	15 05 44	19.6977156	2577320
389	15 13 21	19.7230829	2570694
390	15 21 00	19.7484177	2564103
391	15 28 81	19.7737199	2557545
392	15 36 64	19.7989899	2551020
393	15 44 49	19.8242276	2544529
394	15 52 36	19.8494332	2538071
395	15 60 25	19.8746069	2531646
396	15 68 16	19.8997487	2525253
397	15 76 09	19.9248588	2518892
398	15 84 04	19.9499373	2512563
399	15 92 01	19.9749844	2506266
400	16 00 00	20.0000000	2500000

No.	Square	Square Root	Reciprocal .00
401	16 08 01	20.0249844	2493766
402	16 16 04	20.0499377	2487562
403	16 24 09	20.0748599	2481390
404	16 32 16	20.0997512	2475248
405	16 40 25	20.1246118	2469136
406	16 48 36	20.1494417	2463054
407	16 56 49	20.1742410	2457002
408	16 64 64	20.1990099	2450980
409	16 72 81	20.2237484	2444988
410	16 81 00	20.2484567	2439024
411	16 89 21	20.2731349	2433090
412	16 97 44	20.2977831	2427184
413	17 05 69	20.3224014	2421308
414	17 13 96	20.3469899	2415459
415	17 22 25	20.3715488	2409639
416	17 30 56	20.3960781	2403846
417	17 38 89	20.4205779	2398082
418	17 47 24	20.4450483	2392344
419	17 55 61	20.4694895	2386635
420	17 64 00	20.4939015	2380952
421	17 72 41	20.5182845	2375297
422	17 80 84	20.5426386	2369668
423	17 89 29	20.5669638	2364066
424	17 97 76	20.5912603	2358491
425	18 06 25	20.6155281	2352941
426	18 14 76	20.6397674	2347418
427	18 23 29	20.6639783	2341920
428	18 31 84	20.6881609	2336449
429	18 40 41	20.7123152	2331002
430	18 49 00	20.7364414	2325581
431	18 57 61	20.7605395	2320186
432	18 66 24	20.7846097	2314815
433	18 74 89	20.8086520	2309469
434	18 83 56	20.8326667	2304147
435	18 92 25	20.8566536	2298851
436	19 00 96	20.8806130	2293578
437	19 09 69	20.9045450	2288330
438	19 18 44	20.9284495	2283105
439	19 27 21	20.9523268	2277904
440	19 36 00	20.9761770	2272727
441	19 44 81	21.0000000	2267574
442	19 53 64	21.0237960	2262443
443	19 62 49	21.0475652	2257336
444	19 71 36	21.0713075	2252252
445	19 80 25	21.0950231	2247191
446	19 89 16	21.1187121	2242152
447	19 98 09	21.1423745	2237136
448	20 07 04	21.1660105	2232143
449	20 16 01	21.1896201	2227171
450	20 25 00	21.2132034	2222222

No	Square	Square Root	Reciprocal .00
451	20 34 01	21.2367606	2217295
452	20 43 04	21.2602916	2212389
453	20 52 09	21.2837967	2207506
454	20 61 16	21.3072758	2202643
455	20 70 25	21.3307290	2197802
456	20 79 36	21.3541565	2192982
457	20 88 49	21.3775583	2188184
458	20 97 64	21.4009346	2183406
459	21 06 81	21.4242853	2178649
460	21 16 00	21.4476106	2173913
461	21 25 21	21.4709106	2169197
462	21 34 44	21.4941853	2164502
463	21 43 69	21.5174348	2159827
464	21 52 96	21.5406592	2155172
465	21 62 25	21.5638587	2150538
466	21 71 56	21.5870331	2145923
467	21 80 89	21.6101828	2141328
468	21 90 24	21.6333077	2136752
469	21 99 61	21.6564078	2132196
470	22 09 00	21.6794834	2127660
471	22 18 41	21.7025344	2123142
472	22 27 84	21.7255610	2118644
473	22 37 29	21.7485632	2114165
474	22 46 76	21.7715411	2109705
475	22 56 25	21.7944947	2105263
476	22 65 76	21.8174242	2100840
477	22 75 29	21.8403297	2096436
478	22 84 84	21.8632111	2092050
479	22 94 41	21.8860686	2087683
480	23 04 00	21.9089023	2083333
481	23 13 61	21.9317122	2079002
482	23 23 24	21.9544984	2074689
483	23 32 89	21.9772610	2070393
484	23 42 56	22.0000000	2066116
485	23 52 25	22.0227155	2061856
486	23 61 96	22.0454077	2057613
487	23 71 69	22.0680765	2053388
488	23 81 44	22.0907220	2049180
489	23 91 21	22.1133444	2044990
490	24 01 00	22.1359436	2040816
491	24 10 81	22.1585198	2036660
492	24 20 64	22.1810730	2032520
493	24 30 49	22.2036033	2028398
494	24 40 36	22.2261108	2024291
495	24 50 25	22.2485955	2020202
496	24 60 16	22.2710575	2016129
497	24 70 09	22.2934968	2012072
498	24 80 04	22.3159136	2008032
499	24 90 01	22.3383079	2004008
500	25 00 00	22.3606798	2000000

No.	Square	Square Root	Reciprocal .00
501	25 10 01	22.3830293	1996008
502	25 20 04	22.4053565	1992032
503	25 30 09	22.4276615	1988072
504	25 40 16	22.4499443	1984127
505	25 50 25	22.4722051	1980198
506	25 60 36	22.4944438	1976285
507	25 70 49	22.5166605	1972387
508	25 80 64	22.5388553	1968504
509	25 90 81	22.5610283	1964637
510	26 01 00	22.5831796	1960784
511	26 11 21	22.6053091	1956947
512	26 21 44	22.6274170	1953125
513	26 31 69	22.6495033	1949318
514	26 41 96	22.6715681	1945525
515	26 52 25	22.6936114	1941748
516	26 62 56	22.7156334	1937984
517	26 72 89	22.7376340	1934236
518	26 83 24	22.7596134	1930502
519	26 93 61	22.7815715	1926782
520	27 04 00	22.8035085	1923077
521	27 14 41	22.8254244	1919386
522	27 24 84	22.8473193	1915709
523	27 35 29	22.8691933	1912046
524	27 45 76	22.8910463	1908397
525	27 56 25	22.9128785	1904762
526	27 66 76	22.9346899	1901141
527	27 77 29	22.9564806	1897533
528	27 87 84	22.9782506	1893939
529	27 98 41	23.0000000	1890359
530	28 09 00	23.0217289	1886792
531	28 19 61	23.0434372	1883239
532	28 30 24	23.0651252	1879699
533	28 40 89	23.0867928	1876173
534	28 51 56	23.1084400	1872659
535	28 62 25	23.1300670	1869159
536	28 72 96	23.1516738	1865672
537	28 83 69	23.1732605	1862197
538	28 94 44	23.1948270	1858736
539	29 05 21	23.2163735	1855288
540	29 16 00	23.2379001	1851852
541	29 26 81	23.2594067	1848429
542	29 37 64	23.2808935	1845018
543	29 48 49	23.3023604	1841621
544	29 59 36	23.3238076	1838235
545	29 70 25	23.3452351	1834862
546	29 81 16	23.3666429	1831502
547	29 92 09	23.3880311	1828154
548	30 03 04	23.4093998	1824818
549	30 14 01	23.4307490	1821494
550	30 25 00	23.4520788	1818182

No.	Square	Square Root	Reciprocal .00
551	30 36 01	23.4733892	1814882
552	30 47 04	23.4946802	1811594
553	30 58 09	23.5159520	1808318
554	30 69 16	23.5372046	1805054
555	30 80 25	23.5584380	1801802
556	30 91 36	23.5796522	1798561
557	31 02 49	23.6008474	1795332
558	31 13 64	23.6220236	1792115
559	31 24 81	23.6431808	1788909
560	31 36 00	23.6643191	1785714
561	31 47 21	23.6854386	1782531
562	31 58 44	23.7065392	1779359
563	31 69 69	23.7276210	1776199
564	31 80 96	23.7486842	1773050
565	31 92 25	23.7697286	1769912
566	32 03 56	23.7907545	1766784
567	32 14 89	23.8117618	1763668
568	32 26 24	23.8327506	1760563
569	32 37 61	23.8537209	1757469
570	32 49 00	23.8746728	1754386
571	32 60 41	23.8956063	1751313
572	32 71 84	23.9165215	1748252
573	32 83 29	23.9374184	1745201
574	32 94 76	23.9582971	1742160
575	33 06 25	23.9791576	1739130
576	33 17 76	24.0000000	1736111
577	33 29 29	24.0208243	1733102
578	33 40 84	24.0416306	1730104
579	33 52 41	24.0624188	1727116
580	33 64 00	24.0831891	1724138
581	33 75 61	24.1039416	1721170
582	33 87 24	24.1246762	1718213
583	33 98 89	24.1453929	1715266
584	34 10 56	24.1660919	1712329
585	34 22 25	24.1867732	1709402
586	34 33 96	24.2074369	1706485
587	34 45 69	24.2280829	1703578
588	34 57 44	24.2487113	1700680
589	34 69 21	24.2693222	1697793
590	34 81 00	24.2899156	1694915
591	34 92 81	24.3104916	1692047
592	35 04 64	24.3310501	1689189
593	35 16 49	24.3515913	1686341
594	35 28 36	24.3721152	1683502
595	35 40 25	24.3926218	1680672
596	35 52 16	24.4131112	1677852
597	35 64 09	24.4335834	1675042
598	35 76 04	24.4540385	1672241
599	35 88 01	24.4744765	1669449
600	36 00 00	24.4948974	1666667

No.	Square	Square Root	Reciprocal .00
601	36 12 01	24.5153013	1663894
602	36 24 04	24.5356883	1661130
603	36 36 09	24.5560583	1658375
604	36 48 16	24.5764115	1655629
605	36 60 25	24.5967478	1652893
606	36 72 36	24.6170673	1650165
607	36 84 49	24.6373700	1647446
608	36 96 64	24.6576560	1644737
609	37 08 81	24.6779254	1642036
610	37 21 00	24.6981781	1639344
611	37 33 21	24.7184142	1636661
612	37 45 44	24.7386338	1633987
613	37 57 69	24.7588368	1631321
614	37 69 96	24.7790234	1628664
615	37 82 25	24.7991935	1626016
616	37 94 56	24.8193473	1623377
617	38 06 89	24.8394847	1620746
618	38 19 24	24.8596058	1618123
619	38 31 61	24.8797106	1615509
620	38 44 00	24.8997992	1612903
621	38 56 41	24.9198716	1610306
622	38 68 84	24.9399278	1607717
623	38 81 29	24.9599679	1605136
624	38 93 76	24.9799920	1602564
625	39 06 25	25.0000000	1600000
626	39 18 76	25.0199920	1597444
627	39 31 29	25.0399681	1594896
628	39 43 84	25.0599282	1592357
629	39 56 41	25.0798724	1589825
630	39 69 00	25.0998008	1587302
631	39 81 61	25.1197134	1584786
632	39 94 24	25.1396102	1582278
633	40 06 89	25.1594913	1579779
634	40 19 56	25.1793566	1577287
635	40 32 25	25.1992063	1574803
636	40 44 96	25.2190404	1572327
637	40 57 69	25.2388589	1569859
638	40 70 44	25.2586619	1567398
639	40 83 21	25.2784493	1564945
640	40 96 00	25.2982213	1562500
641	41 08 81	25.3179778	1560062
642	41 21 64	25.3377189	1557632
643	41 34 49	25.3574447	1555210
644	41 47 36	25.3771551	1552795
645	41 60 25	25.3968502	1550388
646	41 73 16	25.4165301	1547988
647	41 86 09	25.4361947	1545595
648	41 99 04	25.4558441	1543210
649	42 12 01	25.4754784	1540832
650	42 25 00	25.4950976	1538462

No.	Square	Square Root	Reciprocal .00
651	42 38 01	25.5147016	1536098
652	42 51 04	25.5342907	1533742
653	42 64 09	25.5538647	1531394
654	42 77 16	25.5734237	1529052
655	42 90 25	25.5929678	1526718
656	43 03 36	25.6124969	1524390
657	43 16 49	25.6320112	1522070
658	43 29 64	25.6515107	1519757
659	43 42 81	25.6709953	1517451
660	43 56 00	25.6904652	1515152
661	43 69 21	25.7099203	1512859
662	43 82 44	25.7293607	1510574
663	43 95 69	25.7487864	1508296
664	44 08 96	25.7681975	1506024
665	44 22 25	25.7875939	1503759
666	44 35 56	25.8069758	1501502
667	44 48 89	25.8263431	1499250
668	44 62 24	25.8456960	1497006
669	44 75 61	25.8650343	1494768
670	44 89 00	25.8843582	1492537
671	45 02 41	25.9036677	1490313
672	45 15 84	25.9229628	1488095
673	45 29 29	25.9422435	1485884
674	45 42 76	25.9615100	1483680
675	45 56 25	25.9807621	1481481
676	45 69 76	26.0000000	1479290
677	45 83 29	26.0192237	1477105
678	45 96 84	26.0384331	1474926
679	46 10 41	26.0576284	1472754
680	46 24 00	26.0768096	1470588
681	46 37 61	26.0959767	1468429
682	46 51 24	26.1151297	1466276
683	46 64 89	26.1342687	1464129
684	46 78 56	26.1533937	1461988
685	46 92 25	26.1725047	1459854
686	47 05 96	26.1916017	1457726
687	47 19 69	26.2106848	1455604
688	47 33 44	26.2297541	1453488
689	47 47 21	26.2488095	1451379
690	47 61 00	26.2678511	1449275
691	47 74 81	26.2868789	1447178
692	47 88 64	26.3058929	1445087
693	48 02 49	26.3248932	1443001
694	48 16 36	26.3438797	1440922
695	48 30 25	26.3628527	1438849
696	48 44 16	26.3818119	1436782
697	48 58 09	26.4007576	1434720
698	48 72 04	26.4196896	1432665
699	48 86 01	26.4386081	1430615
700	49 00 00	26.4575131	1428571

No.	Square	Square Root	Reciprocal .00
701	49 14 01	26.4764046	1426534
702	49 28 04	26.4952826	1424501
703	49 42 09	26.5141472	1422475
704	49 56 16	26.5329983	1420455
705	49 70 25	26.5518361	1418440
706	49 84 36	26.5706605	1416431
707	49 98 49	26.5894716	1414427
708	50 12 64	26.6082694	1412429
709	50 26 81	26.6270539	1410437
710	50 41 00	26.6458252	1408451
711	50 55 21	26.6645833	1406470
712	50 69 44	26.6833281	1404494
713	50 83 69	26.7020598	1402525
714	50 97 96	26.7207784	1400560
715	51 12 25	26.7394839	1398601
716	51 26 56	26.7581763	1396648
717	51 40 89	26.7768557	1394700
718	51 55 24	26.7955220	1392758
719	51 69 61	26.8141754	1390821
720	51 84 00	26.8328157	1388889
721	51 98 41	26.8514432	1386963
722	52 12 84	26.8700577	1385042
723	52 27 29	26.8886593	1383126
724	52 41 76	26.9072481	1381215
725	52 56 25	26.9258240	1379310
726	52 70 76	26.9443872	1377410
727	52 85 29	26.9629375	1375516
728	52 99 84	26.9814751	1373626
729	53 14 41	27.0000000	1371742
730	53 29 00	27.0185122	1369863
731	53 43 61	27.0370117	1367989
732	53 58 24	27.0554985	1366120
733	53 72 89	27.0739727	1364256
734	53 87 56	27.0924344	1362398
735	54 02 25	27.1108834	1360544
736	54 16 96	27.1293199	1358696
737	54 31 69	27.1477439	1356852
738	54 46 44	27.1661554	1355014
739	54 61 21	27.1845544	1353180
740	54 76 00	27.2029410	1351351
741	54 90 81	27.2213152	1349528
742	55 05 64	27.2396769	1347709
743	55 20 49	27.2580263	1345895
744	55 35 36	27.2763634	1344086
745	55 50 25	27.2946881	1342282
746	55 65 16	27.3130006	1340483
747	55 80 09	27.3313007	1338688
748	55 95 04	27.3495887	1336898
749	56 10 01	27.3678644	1335113
750	56 25 00	27.3861279	1333333

No.	Square	Square Root	Reciprocal .00
751	56 40 01	27.4043792	1331558
752	56 55 04	27.4226184	1329787
753	56 70 09	27.4408455	1328021
754	56 85 16	27.4590604	1326260
755	57 00 25	27.4772633	1324503
756	57 15 36	27.4954542	1322751
757	57 30 49	27.5136330	1321004
758	57 45 64	27.5317998	1319261
759	57 60 81	27.5499546	1317523
760	57 76 00	27.5680975	1315789
761	57 91 21	27.5862284	1314060
762	58 06 44	27.6043475	1312336
763	58 21 69	27.6224546	1310616
764	58 36 96	27.6405499	1308901
765	58 52 25	27.6586334	1307190
766	58 67 56	27.6767050	1305483
767	58 82 89	27.6947648	1303781
768	58 98 24	27.7128129	1302083
769	59 13 61	27.7308492	1300390
770	59 29 00	27.7488739	1298701
771	59 44 41	27.7668868	1297017
772	59 59 84	27.7848880	1295337
773	59 75 29	27.8028775	1293661
774	59 90 76	27.8208555	1291990
775	60 06 25	27.8388218	1290323
776	60 21 06	27.8567766	1288660
777	60 37 29	27.8747197	1287001
778	60 52 84	27.8926514	1285347
779	60 68 41	27.9105715	1283697
780	60 84 00	27.9284801	1282051
781	60 99 61	27.9463772	1280410
782	61 15 24	27.9642629	1278772
783	61 30 89	27.9821372	1277139
784	61 46 56	28.0000000	1275510
785	61 62 25	28.0178515	1273885
786	61 77 96	28.0356915	1272265
787	61 93 69	28.0535203	1270648
788	62 09 44	28.0713377	1269036
789	62 25 21	28.0891438	1267427
790	62 41 00	28.1069386	1265823
791	62 56 81	28.1247222	1264223
792	62 72 64	28.1424946	1262626
793	62 88 49	28.1602557	1261034
794	63 04 36	28.1780056	1259446
795	63 20 25	28.1957444	1257862
796	63 36 16	28.2134720	1256281
797	63 52 09	28.2311884	1254705
798	63 68 04	28.2488938	1253133
799	63 84 01	28.2665881	1251564
800	64 00 00	28.2842712	1250000

No.	Square	Square Root	Reciprocal .00
801	64 16 01	28.3019434	1248439
802	64 32 04	28.3196045	1246883
803	64 48 09	28.3372546	1245330
804	64 64 16	28.3548938	1243781
805	64 80 25	28.3725219	1242236
806	64 96 36	28.3901391	1240695
807	65 12 49	28.4077454	1239157
808	65 28 64	28.4253408	1237624
809	65 44 81	28.4429253	1236094
810	65 61 00	28.4604989	1234568
811	65 77 21	28.4780617	1233046
812	65 93 44	28.4956137	1231527
813	66 09 69	28.5131549	1230012
814	66 25 96	28.5306852	1228501
815	66 42 25	28.5482048	1226994
816	66 58 56	28.5657137	1225490
817	66 74 89	28.5832119	1223990
818	66 91 24	28.6006993	1222494
819	67 07 61	28.6181760	1221001
820	67 24 00	28.6356421	1219512
821	67 40 41	28.6530976	1218027
822	67 56 84	28.6705424	1216545
823	67 73 29	28.6879766	1215067
824	67 89 76	28.7054002	1213592
825	68 06 25	28.7228132	1212121
826	68 22 76	28.7402157	1210654
827	68 39 29	28.7576077	1209190
828	68 55 84	28.7749891	1207729
829	68 72 41	28.7923601	1206273
830	68 89 00	28.8097206	1204819
831	69 05 61	28.8270706	1203369
832	69 22 24	28.8444102	1201923
833	69 38 89	28.8617394	1200480
834	69 55 56	28.8790582	1199041
835	69 72 25	28.8963666	1197605
836	69 88 96	28.9136646	1196172
837	70 05 69	28.9309523	1194743
838	70 22 44	28.9482297	1193317
839	70 39 21	28.9654967	1191895
840	70 56 00	28.9827535	1190476
841	70 72 81	29.0000000	1189061
842	70 89 64	29.0172363	1187648
843	71 06 49	29.0344623	1186240
844	71 23 36	29.0516781	1184834
845	71 40 25	29.0688837	1183432
846	71 57 16	29.0860791	1182033
847	71 74 09	29.1032644	1180638
848	71 91 04	29.1204396	1179245
849	72 08 01	29.1376046	1177856
850	72 25 00	29.1547595	1176471

No.	Square	Square Root	Reciprocal .00
851	72 42 01	29.1719043	1175088
852	72 59 04	29.1890390	1173709
853	72 76 09	29.2061637	1172333
854	72 93 16	29.2232784	1170960
855	73 10 25	29.2403830	1169591
856	73 27 36	29.2574777	1168224
857	73 44 49	29.2745623	1166861
858	73 61 64	29.2916370	1165501
859	73 78 81	29.3087018	1164144
860	73 96 00	29.3257566	1162791
861	74 13 21	29.3428015	1161440
862	74 30 44	29.3598365	1160093
863	74 47 69	29.3768616	1158749
864	74 64 96	29.3938769	1157407
865	74 82 25	29.4108823	1156069
866	74 99 56	29.4278779	1154734
867	75 16 89	29.4448637	1153403
868	75 34 24	29.4618397	1152074
869	75 51 61	29.4788059	1150748
870	75 69 00	29.4957624	1149425
871	75 86 41	29.5127091	1148106
872	76 03 84	29.5296461	1146789
873	76 21 29	29.5465734	1145475
874	76 38 76	29.5634910	1144165
875	76 56 25	29.5803989	1142857
876	76 73 76	29.5972972	1141553
877	76 91 29	29.6141858	1140251
878	77 08 84	29.6310648	1138952
879	77 26 41	29.6479342	1137656
880	77 44 00	29.6647939	1136364
881	77 61 61	29.6816442	1135074
882	77 79 24	29.6984848	1133787
883	77 96 89	29.7153159	1132503
884	78 14 56	29.7321375	1131222
885	78 32 25	29.7489496	1129944
886	78 49 96	29.7657521	1128668
887	78 67 69	29.7825452	1127396
888	78 85 44	29.7993289	1126126
889	79 03 21	29.8161030	1124859
890	79 21 00	29.8328678	1123596
891	79 38 81	29.8496231	1122334
892	79 56 64	29.8663690	1121076
893	79 74 49	29.8831056	1119821
894	79 92 36	29.8998328	1118568
895	80 10 25	29.9165506	1117318
896	80 28 16	29.9332591	1116071
897	80 46 09	29.9499583	1114827
898	80 64 04	29.9666481	1113586
899	80 82 01	29.9833287	1112347
900	81 00 00	30.0000000	1111111

No.	Square	Square Root	Reciprocal .00
901	81 18 01	30.0166620	1109878
902	81 36 04	30.0333148	1108647
903	81 54 09	30.0499584	1107420
904	81 72 16	30.0665928	1106195
905	81 90 25	30.0832179	1104972
906	82 08 36	30.0998339	1103753
907	82 26 49	30.1164407	1102536
908	82 44 64	30.1330383	1101322
909	82 62 81	30.1496269	1100110
910	82 81 00	30.1662063	1098901
911	82 99 21	30.1827765	1097695
912	83 17 44	30.1993377	1096491
913	83 35 69	30.2158899	1095290
914	83 53 96	30.2324329	1094092
915	83 72 25	30.2489669	1092896
916	83 90 56	30.2654919	1091703
917	84 08 89	30.2820079	1090513
918	84 27 24	30.2985148	1089325
919	84 45 61	30.3150128	1088139
920	84 64 00	30.3315018	1086957
921	84 82 41	30.3479818	1085776
922	85 00 84	30.3644529	1084599
923	85 19 29	30.3809151	1083424
924	85 37 76	30.3973683	1082251
925	85 56 25	30.4138127	1081081
926	85 74 76	30.4302481	1079914
927	85 93 29	30.4466747	1078749
928	86 11 84	30.4630924	1077586
929	86 30 41	30.4795013	1076426
930	86 49 00	30.4959014	1075269
931	86 67 61	30.5122926	1074114
932	86 86 24	30.5286750	1072961
933	87 04 89	30.5450487	1071811
934	87 23 56	30.5614136	1070664
935	87 42 25	30.5777697	1069519
936	87 60 96	30.5941171	1068376
937	87 79 69	30.6104557	1067236
938	87 98 44	30.6267857	1066098
939	88 17 21	30.6431069	1064963
940	88 36 00	30.6594194	1063830
941	88 54 81	30.6757233	1062699
942	88 73 64	30.6920185	1061571
943	88 92 49	30.7083051	1060445
944	89 11 36	30.7245830	1059322
945	89 30 25	30.7408523	1058201
946	89 49 16	30.7571130	1057082
947	89 68 09	30.7733651	1055966
948	89 87 04	30.7896086	1054852
949	90 06 01	30.8058436	1053741
950	90 25 00	30.8220700	1052632

No.	Square	Square Root	Reciprocal .00
951	90 44 01	30.8382879	1051525
952	90 63 04	30.8544972	1050420
953	90 82 09	30.8706981	1049318
954	91 01 16	30.8868904	1048218
955	91 20 25	30.9030743	1047120
956	91 39 36	30.9192497	1046025
957	91 58 49	30.9354166	1044932
958	91 77 64	30.9515751	1043841
959	91 96 81	30.9677251	1042753
960	92 16 00	30.9838668	1041667
961	92 35 21	31.0000000	1040583
962	92 54 44	31.0161248	1039501
963	92 73 69	31.0322413	1038422
964	92 92 96	31.0483494	1037344
965	93 12 25	31.0644491	1036269
966	93 31 56	31.0805405	1035197
967	93 50 89	31.0966236	1034126
968	93 70 24	31.1126984	1033058
969	93 89 61	31.1287648	1031992
970	94 09 00	31.1448230	1030928
971	94 28 41	31.1608729	1029866
972	94 47 84	31.1769145	1028807
973	94 67 29	31.1929479	1027749
974	94 86 76	31.2089731	1026694
975	95 06 25	31.2249900	1025641
976	95 25 76	31.2409987	1024590
977	95 45 29	31.2569992	1023541
978	95 64 84	31.2729915	1022495
979	95 84 41	31.2889757	1021450
980	96 04 00	31.3049517	1020408
981	96 23 61	31.3209195	1019368
982	96 43 24	31.3368792	1018330
983	96 62 89	31.3528308	1017294
984	96 82 56	31.3687743	1016260
985	97 02 25	31.3847097	1015228
986	97 21 96	31.4006369	1014199
987	97 41 69	31.4165561	1013171
988	97 61 44	31.4324673	1012146
989	97 81 21	31.4483704	1011122
990	98 01 00	31.4642654	1010101
991	98 20 81	31.4801525	1009082
992	98 40 64	31.4960315	1008065
993	98 60 49	31.5119025	1007049
994	98 80 36	31.5277655	1006036
995	99 00 25	31.5436206	1005025
996	99 20 16	31.5594677	1004016
997	99 40 09	31.5753068	1003009
998	99 60 04	31.5911380	1002004
999	99 80 01	31.6069613	1001001
1000	1 00 00 00	31.6227766	1000000

APPENDIX I

COMMON LOGARITHMS OF NUMBERS FROM 1 TO 10,000

A Six-Place Table with Proportional Parts to Aid in Interpolation

Note. — For the logarithm of a number under 100 look up the mantissa of the number × 100 and add the proper characteristic. The mantissa is the same whether the number in question be, say, 17, 170, or 1700. To ascertain the logarithm of 17, then, determine the mantissa of 1700, which is .230449, and prefix the characteristic 1, giving the logarithm of 17 as 1.230449.

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Proportional Parts				Proportional Parts				Proportional Parts				Proportional Parts			
	434	433	432		431	430	429		428	427	426		425	424	423
1	43.4	43.3	43.2	1	43.1	43.0	42.9	1	42.8	42.7	42.6	1	42.5	42.4	42.3
2	86.8	86.6	86.4	2	86.2	86.0	85.8	2	85.6	85.4	85.2	2	85.0	84.8	84.6
3	130.2	129.9	129.6	3	129.3	129.0	128.7	3	128.4	128.1	127.8	3	127.5	127.2	126.9
4	173.6	173.2	172.8	4	172.4	172.0	171.6	4	171.2	170.8	170.4	4	170.0	169.6	169.2
5	217.0	216.5	216.0	5	215.5	215.0	214.5	5	214.0	213.5	213.0	5	212.5	212.0	211.5
6	260.4	259.8	259.2	6	258.6	258.0	257.4	6	256.8	256.2	255.6	6	255.0	254.4	253.8
7	303.8	303.1	302.4	7	301.7	301.0	300.3	7	299.6	298.9	298.2	7	297.5	296.8	296.1
8	347.2	346.4	345.6	8	344.8	344.0	343.2	8	342.4	341.6	340.8	8	340.0	339.2	338.4
9	390.6	389.7	388.8	9	387.9	387.0	386.1	9	385.2	384.3	383.4	9	382.5	381.6	380.7
	422	421	420		419	418	417		416	415	414		413	412	411
1	42.2	42.1	42.0	1	41.9	41.8	41.7	1	41.6	41.5	41.4	1	41.3	41.2	41.1
2	84.4	84.2	84.0	2	83.8	83.6	83.4	2	83.2	83.0	82.8	2	82.6	82.4	82.2
3	126.6	126.3	126.0	3	125.7	125.4	125.1	3	124.8	124.5	124.2	3	123.9	123.6	123.3
4	168.8	168.4	168.0	4	167.6	167.2	166.8	4	166.4	166.0	165.6	4	165.2	164.8	164.4
5	211.0	210.5	210.0	5	209.5	209.0	208.5	5	208.0	207.5	207.0	5	206.5	206.0	205.5
6	253.2	252.6	252.0	6	251.4	250.8	250.2	6	249.6	249.0	248.4	6	247.8	247.2	246.6
7	295.4	294.7	294.0	7	293.3	292.6	291.9	7	291.2	290.5	289.8	7	289.1	288.4	287.7
8	337.6	336.8	336.0	8	335.2	334.4	333.6	8	332.8	332.0	331.2	8	330.4	329.6	328.8
9	379.8	378.9	378.0	9	377.1	376.2	375.3	9	374.4	373.5	372.6	9	371.7	370.8	369.9
	410	409	408		407	406	405		404	403	402		401	400	399
1	41.0	40.9	40.8	1	40.7	40.6	40.5	1	40.4	40.3	40.2	1	40.1	40.0	39.9
2	82.0	81.8	81.6	2	81.4	81.2	81.0	2	80.8	80.6	80.4	2	80.2	80.0	79.8
3	123.0	122.7	122.4	3	122.1	121.8	121.5	3	121.2	120.9	120.6	3	120.3	120.0	119.7
4	164.0	163.6	163.2	4	162.8	162.4	162.0	4	161.6	161.2	160.8	4	160.4	160.0	159.6
5	205.0	204.5	204.0	5	203.5	203.0	202.5	5	202.0	201.5	201.0	5	200.5	200.0	199.5
6	246.0	245.4	244.8	6	244.2	243.6	243.0	6	242.4	241.8	241.2	6	240.6	240.0	239.4
7	287.0	286.3	285.6	7	284.9	284.2	283.5	7	282.8	282.1	281.4	7	280.7	280.0	279.3
8	328.0	327.2	326.4	8	325.6	324.8	324.0	8	323.2	322.4	321.6	8	320.8	320.0	319.2
9	369.0	368.1	367.2	9	366.3	365.4	364.5	9	363.6	362.7	361.8	9	360.9	360.0	359.1
	398	397	396		395	394	393		392	391	390		389	388	387
1	39.8	39.7	39.6	1	39.5	39.4	39.3	1	39.2	39.1	39.0	1	38.9	38.8	38.7
2	79.6	79.4	79.2	2	79.0	78.8	78.6	2	78.4	78.2	78.0	2	77.8	77.6	77.4
3	119.4	119.1	118.8	3	118.5	118.2	117.9	3	117.6	117.3	117.0	3	116.7	116.4	116.1
4	159.2	158.8	158.4	4	158.0	157.6	157.2	4	156.8	156.4	156.0	4	155.6	155.2	154.8
5	199.0	198.5	198.0	5	197.5	197.0	196.5	5	196.0	195.5	195.0	5	194.5	194.0	193.5
6	238.8	238.2	237.6	6	237.0	236.4	235.8	6	235.2	234.6	234.0	6	233.4	232.8	232.2
7	278.6	277.9	277.2	7	276.5	275.8	275.1	7	274.4	273.7	273.0	7	272.3	271.6	270.9
8	318.4	317.6	316.8	8	316.0	315.2	314.4	8	313.6	312.8	312.0	8	311.2	310.4	309.6
9	358.2	357.3	356.4	9	355.5	354.6	353.7	9	352.8	351.9	351.0	9	350.1	349.2	348.3

LOGARITHMS

N	0	1	2	3	4	5	6	7	8	9
100	00 0000	0434	0868	1301	1734	2166	2598	3029	3461	3891
01	4321	4751	5181	5609	6038	6466	6894	7321	7748	8174
02	8600	9026	9451	9876	*0300	*0724	*1147	*1570	*1993	*2415
03	01 2837	3259	3680	4100	4521	4940	5360	5779	6197	6616
04	7033	7451	7868	8284	8700	9116	9532	9947	*0361	*0775
05	02 1189	1603	2016	2428	2841	3252	3664	4075	4486	4896
06	5306	5715	6125	6533	6942	7350	7757	8164	8571	8978
07	9384	9789	*0195	*0600	*1004	*1408	*1812	*2216	*2619	*3021
08	03 3424	3826	4227	4628	5029	5430	5830	6230	6629	7028
09	7426	7825	8223	8620	9017	9414	9811	*0207	*0602	*0998
110	04 1393	1787	2182	2576	2969	3362	3755	4148	4540	4932
11	5323	5714	6105	6495	6885	7275	7664	8053	8442	8830
12	9218	9606	9993	*0380	*0766	*1153	*1538	*1924	*2309	*2694
13	05 3078	3463	3846	4230	4613	4996	5378	5760	6142	6524
14	6905	7286	7666	8046	8426	8805	9185	9563	9942	*0320
115	06 0698	1075	1452	1829	2206	2582	2958	3333	3709	4083

Proportional Parts				Proportional Parts			
	386	385	384		383	382	381
1	38.6	38.5	38.4	1	38.3	38.2	38.1
2	77.2	77.0	76.8	2	76.6	76.4	76.2
3	115.8	115.5	115.2	3	114.9	114.6	114.3
4	154.4	154.0	153.6	4	153.2	152.8	152.4
5	193.0	192.5	192.0	5	191.5	191.0	190.5
6	231.6	231.0	230.4	6	229.8	229.2	228.6
7	270.2	269.5	268.8	7	268.1	267.4	266.7
8	308.8	308.0	307.2	8	306.4	305.6	304.8
9	347.4	346.5	345.6	9	344.7	343.8	342.9

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Proportional Parts				Proportional Parts				Proportional Parts				Proportional Parts			
	380	**379**	**378**		**377**	**376**	**375**		**374**	**373**	**372**		**371**	**370**	**369**
1	38.0	37.9	37.8	1	37.7	37.6	37.5	1	37.4	37.3	37.2	1	37.1	37.0	36.9
2	76.0	75.8	75.6	2	75.4	75.2	75.0	2	74.8	74.6	74.4	2	74.2	74.0	73.8
3	114.0	113.7	113.4	3	113.1	112.8	112.5	3	112.2	111.9	111.6	3	111.3	111.0	110.7
4	152.0	151.6	151.2	4	150.8	150.4	150.0	4	149.6	149.2	148.8	4	148.4	148.0	147.6
5	190.0	189.5	189.0	5	188.5	188.0	187.5	5	187.0	186.5	186.0	5	185.5	185.0	184.5
6	228.0	227.4	226.8	6	226.2	225.6	225.0	6	224.4	223.8	223.2	6	222.6	222.0	221.4
7	266.0	265.3	264.6	7	263.9	263.2	262.5	7	261.8	261.1	260.4	7	259.7	259.0	258.3
8	304.0	303.2	302.4	8	301.6	300.8	300.0	8	299.2	298.4	297.6	8	296.8	296.0	295.2
9	342.0	341.1	340.2	9	339.3	338.4	337.5	9	336.6	335.7	334.8	9	333.9	333.0	332.1
	368	**367**	**366**		**365**	**364**	**363**		**362**	**361**	**360**		**359**	**358**	**357**
1	36.8	36.7	36.6	1	36.5	36.4	36.3	1	36.2	36.1	36.0	1	35.9	35.8	35.7
2	73.6	73.4	73.2	2	73.0	72.8	72.6	2	72.4	72.2	72.0	2	71.8	71.6	71.4
3	110.4	110.1	109.8	3	109.5	109.2	108.9	3	108.6	108.3	108.0	3	107.7	107.4	107.1
4	147.2	146.8	146.4	4	146.0	145.6	145.2	4	144.8	144.4	144.0	4	143.6	143.2	142.8
5	184.0	183.5	183.0	5	182.5	182.0	181.5	5	181.0	180.5	180.0	5	179.5	179.0	178.5
6	220.8	220.2	219.6	6	219.0	218.4	217.8	6	217.2	216.6	216.0	6	215.4	214.8	214.2
7	257.6	256.9	256.2	7	255.7	254.8	254.1	7	253.4	252.7	252.0	7	251.3	250.6	249.9
8	294.4	293.6	292.8	8	292.0	291.2	290.4	8	289.6	288.8	288.0	8	287.2	286.4	285.6
9	331.2	330.3	329.4	9	328.5	327.6	326.7	9	325.8	324.9	324.0	9	323.1	322.2	321.3
	356	**355**	**354**		**353**	**352**	**351**		**350**	**349**	**348**		**347**	**346**	**345**
1	35.6	35.5	35.4	1	35.3	35.2	35.1	1	35.0	34.9	34.8	1	34.7	34.6	34.5
2	71.2	71.0	70.8	2	70.6	70.4	70.2	2	70.0	69.8	69.6	2	69.4	69.2	69.0
3	106.8	106.5	106.2	3	105.9	105.6	105.3	3	105.0	104.7	104.4	3	104.1	103.8	103.5
4	142.4	142.0	141.6	4	141.2	140.8	140.4	4	140.0	139.6	139.2	4	138.8	138.4	138.0
5	178.0	177.5	177.0	5	176.5	176.0	175.5	5	175.0	174.5	174.0	5	173.5	173.0	172.5
6	213.6	213.0	212.4	6	211.8	211.2	210.6	6	210.0	209.4	208.8	6	208.2	207.6	207.0
7	249.2	248.5	247.8	7	247.1	246.4	245.7	7	245.0	244.3	243.6	7	242.9	242.2	241.5
8	284.8	284.0	283.2	8	282.4	281.6	280.8	8	280.0	279.2	278.4	8	277.6	276.8	276.0
9	320.4	319.5	318.6	9	317.7	316.8	315.9	9	315.0	314.1	313.2	9	312.3	311.4	310.5
	344	**343**	**342**		**341**	**340**	**339**		**338**	**337**	**336**		**335**		**334**
1	34.4	34.3	34.2	1	34.1	34.0	33.9	1	33.8	33.7	33.6	1	33.5		33.4
2	68.8	68.6	68.4	2	68.2	68.0	67.8	2	67.6	67.4	67.2	2	67.0		66.8
3	103.2	102.9	102.6	3	102.3	102.0	101.7	3	101.4	101.1	100.8	3	100.5		100.2
4	137.6	137.2	136.8	4	136.4	136.0	135.6	4	135.2	134.8	134.4	4	134.0		133.6
5	172.0	171.5	171.0	5	170.5	170.0	169.5	5	169.0	168.5	168.0	5	167.5		167.0
6	206.4	205.8	205.2	6	204.6	204.0	203.4	6	202.8	202.0	201.6	6	201.0		200.4
7	240.8	240.1	239.4	7	238.7	238.0	237.3	7	236.6	235.9	235.2	7	234.5		233.8
8	275.2	274.4	273.6	8	272.8	272.0	271.2	8	270.4	269.6	268.8	8	268.0		267.2
9	309.6	308.7	307.8	9	306.9	306.0	305.1	9	304.2	303.3	302.4	9	301.5		300.6

LOGARITHMS

N	0	1	2	3	4	5	6	7	8	9
115	06 0698	1075	1452	1829	2206	2582	2958	3333	3709	4083
16	4458	4832	5206	5580	5953	6326	6699	7071	7443	7815
17	8186	8557	8928	9298	9668	*0038	*0407	*0776	*1145	*1514
18	07 1882	2250	2617	2985	3352	3718	4085	4451	4816	5182
19	5547	5912	6276	6640	7004	7368	7731	8094	8457	8819
120	07 9181	9543	9904	*0266	*0626	*0987	*1347	*1707	*2067	*2426
21	08 2785	3144	3503	3861	4219	4576	4934	5291	5647	6004
22	6360	6716	7071	7426	7781	8136	8490	8845	9198	9552
23	9905	*0258	*0611	*0963	*1315	*1667	*2018	*2370	*2721	*3071
24	09 3422	3772	4122	4471	4820	5169	5518	5866	6215	6562
25	6910	7257	7604	7951	8298	8644	8990	9335	9681	*0026
26	10 0371	0715	1059	1403	1747	2091	2434	2777	3119	3462
27	3804	4146	4487	4828	5169	5510	5851	6191	6531	6871
28	7210	7549	7888	8227	8565	8903	9241	9579	9916	*0253
29	11 0590	0926	1263	1599	1934	2270	2605	2940	3275	3609
130	11 3943	4277	4611	4944	5278	5611	5943	6276	6608	6940

	333	**332**
1	33.3	33.2
2	66.6	66.4
3	99.9	99.6
4	133.2	132.8
5	166.5	166.0
6	199.8	199.2
7	233.1	232.4
8	266.4	265.6
9	299.7	298.8

130–150

Proportional Parts				Proportional Parts				Proportional Parts				Proportional Parts			
	331	330	329		328	327	326		325	324	323		322	321	320
1	33.1	33.0	32.9	1	32.8	32.7	32.6	1	32.5	32.4	32.3	1	32.2	32.1	32.0
2	66.2	66.0	65.8	2	65.6	65.4	65.2	2	65.0	64.8	64.6	2	64.4	64.2	64.0
3	99.3	99.0	98.7	3	98.4	98.1	97.8	3	97.5	97.2	96.9	3	96.6	96.3	96.0
4	132.4	132.0	131.6	4	131.2	130.8	130.4	4	130.0	129.6	129.2	4	128.8	128.4	128.0
5	165.5	165.0	164.5	5	164.0	163.5	163.0	5	162.5	162.0	161.5	5	161.0	160.5	160.0
6	198.6	198.0	197.4	6	196.8	196.2	195.6	6	195.0	194.4	193.8	6	193.2	192.6	192.0
7	231.7	231.0	230.3	7	229.6	228.9	228.2	7	227.5	226.8	226.1	7	225.4	224.7	224.0
8	264.8	264.0	263.2	8	262.4	261.6	260.8	8	260.0	259.2	258.4	8	257.6	256.8	256.0
9	297.9	297.0	296.1	9	295.2	294.3	293.4	9	292.5	291.6	290.7	9	289.8	288.9	288.0
	319	318	317		316	315	314		313	312	311		310	309	308
1	31.9	31.8	31.7	1	31.6	31.5	31.4	1	31.3	31.2	31.1	1	31.0	30.9	30.8
2	63.8	63.6	63.4	2	63.2	63.0	62.8	2	62.6	62.4	62.2	2	62.0	61.8	61.6
3	95.7	95.4	95.1	3	94.8	94.5	94.2	3	93.9	93.6	93.3	3	93.0	92.7	92.4
4	127.6	127.2	126.8	4	126.4	126.0	125.6	4	125.2	124.8	124.4	4	124.0	123.6	123.2
5	159.5	159.0	158.5	5	158.0	157.5	157.0	5	156.5	156.0	155.5	5	155.0	154.5	154.0
6	191.4	190.8	190.2	6	189.6	189.0	188.4	6	187.8	187.2	186.6	6	186.0	185.4	184.8
7	223.3	222.6	221.9	7	221.2	220.5	219.8	7	219.1	218.4	217.7	7	217.0	216.3	215.6
8	255.2	254.4	253.6	8	252.8	252.0	251.2	8	250.4	249.6	248.8	8	248.0	247.2	246.4
9	287.1	286.2	285.3	9	284.4	283.5	282.6	9	281.7	280.8	279.9	9	279.0	278.1	277.2
	307	306	305		304	303	302		301	300	299		298	297	296
1	30.7	30.6	30.5	1	30.4	30.3	30.2	1	30.1	30.0	29.9	1	29.8	29.7	29.6
2	61.4	61.2	61.0	2	60.8	60.6	60.4	2	60.2	60.0	59.8	2	59.6	59.4	59.2
3	92.1	91.8	91.5	3	91.2	90.9	90.6	3	90.3	90.0	89.7	3	89.4	89.1	88.8
4	122.8	122.4	122.0	4	121.6	121.2	120.8	4	120.4	120.0	119.6	4	119.2	118.8	118.4
5	153.5	153.0	152.5	5	152.0	151.5	151.0	5	150.5	150.0	149.5	5	149.0	148.5	148.0
6	184.2	183.6	183.0	6	182.4	181.8	181.2	6	180.6	180.0	179.4	6	178.8	178.2	177.6
7	214.9	214.2	213.5	7	212.8	212.1	211.4	7	210.7	210.0	209.3	7	208.6	207.9	207.2
8	245.6	244.8	244.0	8	243.2	242.4	241.6	8	240.8	240.0	239.2	8	238.4	237.6	236.8
9	276.3	275.4	274.5	9	273.6	272.7	271.8	9	270.9	270.0	269.1	9	268.2	267.3	266.4

LOGARITHMS

N	0	1	2	3	4	5	6	7	8	9
130	11 3943	4277	4611	4944	5278	5611	5943	6276	6608	6940
31	7271	7603	7934	8265	8595	8926	9256	9586	9915	*0245
32	12 0574	0903	1231	1560	1888	2216	2544	2871	3198	3525
33	3852	4178	4504	4830	5156	5481	5806	6131	6456	6781
34	7105	7429	7753	8076	8399	8722	9045	9368	9690	*0012
35	13 0334	0655	0977	1298	1619	1939	2260	2580	2900	3219
36	3539	3858	4177	4496	4814	5133	5451	5769	6086	6403
37	6721	7037	7354	7671	7987	8303	8618	8934	9249	9564
38	9879	*0194	*0508	*0822	*1136	*1450	*1763	*2076	*2389	*2702
39	14 3015	3327	3639	3951	4263	4574	4885	5196	5507	5818
140	14 6128	6438	6748	7058	7367	7676	7985	8294	8603	8911
41	9219	9527	9835	*0142	*0449	*0756	*1063	*1370	*1676	*1982
42	15 2288	2594	2900	3205	3510	3815	4120	4424	4728	5032
43	5336	5640	5943	6246	6549	6852	7154	7457	7759	8061
44	8362	8664	8965	9266	9567	9868	*0168	*0469	*0769	*1068
45	16 1368	1667	1967	2266	2564	2863	3161	3460	3758	4055
46	4353	4650	4947	5244	5541	5838	6134	6430	6726	7022
47	7317	7613	7908	8203	8497	8792	9086	9380	9674	9968
48	17 0262	0555	0848	1141	1434	1726	2019	2311	2603	2895
49	3186	3478	3769	4060	4351	4641	4932	5222	5512	5802
150	6091	6381	6670	6959	7248	7536	7825	8113	8401	8689

Proportional Parts				Proportional Parts			
	295	294	293		292	291	290
1	29.5	29.4	29.3	1	29.2	29.1	29.0
2	59.0	58.8	58.6	2	58.4	58.2	58.0
3	88.5	88.2	87.9	3	87.6	87.3	87.0
4	118.0	117.6	117.2	4	116.8	116.4	116.0
5	147.5	147.0	146.5	5	146.0	145.5	145.0
6	177.0	176.4	175.8	6	175.2	174.6	174.0
7	206.5	205.8	205.1	7	204.4	203.7	203.0
8	236.0	235.2	234.4	8	233.6	232.8	232.0
9	265.5	264.6	263.7	9	262.8	261.9	261.0
					289	288	287
				1	28.9	28.8	28.7
				2	57.8	57.6	57.4
				3	86.7	86.4	86.1
				4	115.6	115.2	114.8
				5	144.5	144.0	143.5
				6	173.4	172.8	172.2
				7	202.3	201.6	200.9
				8	231.2	230.4	229.6
				9	260.1	259.2	258.3

150–170

Proportional Parts				Proportional Parts				Proportional Parts				Proportional Parts			
	290	**289**	**288**		**287**	**286**	**285**		**284**	**283**	**282**		**281**	**280**	**279**
1	29.0	28.9	28.8	**1**	28.7	28.6	28.5	**1**	28.4	28.3	28.2	**1**	28.1	28.0	27.9
2	58.0	57.8	57.6	**2**	57.4	57.2	57.0	**2**	56.8	56.6	56.4	**2**	56.2	56.0	55.8
3	87.0	86.7	86.4	**3**	86.1	85.8	85.5	**3**	85.2	84.9	84.6	**3**	84.3	84.0	83.7
4	116.0	115.6	115.2	**4**	114.8	114.4	114.0	**4**	113.6	113.2	112.8	**4**	112.4	112.0	111.6
5	145.0	144.5	144.0	**5**	143.5	143.0	142.5	**5**	142.0	141.5	141.0	**5**	140.5	140.0	139.5
6	174.0	173.4	172.8	**6**	172.2	171.6	171.0	**6**	170.4	169.8	169.2	**6**	168.6	168.0	167.4
7	203.0	202.3	201.6	**7**	200.9	200.2	199.5	**7**	198.8	198.1	197.4	**7**	196.7	196.0	195.3
8	232.0	231.2	230.4	**8**	229.6	228.8	228.0	**8**	227.2	226.4	225.6	**8**	224.8	224.0	223.2
9	261.0	260.1	259.2	**9**	258.3	257.4	256.5	**9**	255.6	254.7	253.8	**9**	252.9	252.0	251.1
	278	**277**	**276**		**275**	**274**	**273**		**272**	**271**	**270**		**269**	**268**	**267**
1	27.8	27.7	27.6	**1**	27.5	27.4	27.3	**1**	27.2	27.1	27.0	**1**	26.9	26.8	26.7
2	55.6	55.4	55.2	**2**	55.0	54.8	54.6	**2**	54.4	54.2	54.0	**2**	53.8	53.6	53.4
3	83.4	83.1	82.8	**3**	82.5	82.2	81.9	**3**	81.6	81.3	81.0	**3**	80.7	80.4	80.1
4	111.2	110.8	110.4	**4**	110.0	109.6	109.2	**4**	108.8	108.4	108.0	**4**	107.6	107.2	106.8
5	139.0	138.5	138.0	**5**	137.5	137.0	136.5	**5**	136.0	135.5	135.0	**5**	134.5	134.0	133.5
6	166.8	166.2	165.6	**6**	165.0	164.4	163.8	**6**	163.2	162.6	162.0	**6**	161.4	160.8	160.2
7	194.6	193.9	193.2	**7**	192.5	191.8	191.1	**7**	190.4	189.7	189.0	**7**	188.3	187.6	186.9
8	222.4	221.6	220.8	**8**	220.0	219.2	218.4	**8**	217.6	216.8	216.0	**8**	215.2	214.4	213.6
9	250.2	249.3	248.4	**9**	247.5	246.6	245.7	**9**	244.8	243.9	243.0	**9**	242.1	241.2	240.3
	266	**265**	**264**		**263**	**262**	**261**		**260**	**259**	**258**		**257**	**256**	**255**
1	26.6	26.5	26.4	**1**	26.3	26.2	26.1	**1**	26.0	25.9	25.8	**1**	25.7	25.6	25.5
2	53.2	53.0	52.8	**2**	52.6	52.4	52.2	**2**	52.0	51.8	51.6	**2**	51.4	51.2	51.0
3	79.8	79.5	79.2	**3**	78.9	78.6	78.3	**3**	78.0	77.7	77.4	**3**	77.1	76.8	76.5
4	106.4	106.0	105.6	**4**	105.2	104.8	104.4	**4**	104.0	103.6	103.2	**4**	102.8	102.4	102.0
5	133.0	132.5	132.0	**5**	131.5	131.0	130.5	**5**	130.0	129.5	129.0	**5**	128.5	128.0	127.5
6	159.6	159.0	158.4	**6**	157.8	157.2	156.6	**6**	156.0	155.4	154.8	**6**	154.2	153.6	153.0
7	186.2	185.5	184.8	**7**	184.1	183.4	182.7	**7**	182.0	181.3	180.6	**7**	179.9	179.2	178.5
8	212.8	212.0	211.2	**8**	210.4	209.6	208.8	**8**	208.0	207.2	206.4	**8**	205.6	204.8	204.0
9	239.4	238.5	237.6	**9**	236.7	235.8	234.9	**9**	234.0	233.1	232.2	**9**	231.3	230.4	229.5

	254
1	25.4
2	50.8
3	76.2
4	101.6
5	127.0
6	152.4
7	177.8
8	203.2
9	228.6

LOGARITHMS

N	0	1	2	3	4	5	6	7	8	9
150	17 6091	6381	6670	6959	7248	7536	7825	8113	8401	8689
51	8977	9264	9552	9839	*0126	*0413	*0699	*0986	*1272	*1558
52	18 1844	2129	2415	2700	2985	3270	3555	3839	4123	4407
53	4691	4975	5259	5542	5825	6108	6391	6674	6956	7239
54	7521	7803	8084	8366	8647	8928	9209	9490	9771	*0051
55	19 0332	0612	0892	1171	1451	1730	2010	2289	2567	2846
56	3125	3403	3681	3959	4237	4514	4792	5069	5346	5623
57	5900	6176	6453	6729	7005	7281	7556	7832	8107	8382
58	8657	8932	9206	9481	9755	*0029	*0303	*0577	*0850	*1124
59	20 1397	1670	1943	2216	2488	2761	3033	3305	3577	3848
160	20 4120	4391	4663	4934	5204	5475	5746	6016	6286	6556
61	6826	7096	7365	7634	7904	8173	8441	8710	8979	9247
62	9515	9783	*0051	*0319	*0586	*0853	*1121	*1388	*1654	*1921
63	21 2188	2454	2720	2986	3252	3518	3783	4049	4314	4579
64	4844	5109	5373	5638	5902	6166	6430	6694	6957	7221
65	7484	7747	8010	8273	8536	8798	9060	9323	9585	9846
66	22 0108	0370	0631	0892	1153	1414	1675	1936	2196	2456
67	2716	2976	3236	3496	3755	4015	4274	4533	4792	5051
68	5309	5568	5826	6084	6342	6600	6858	7115	7372	7630
69	7887	8144	8400	8657	8913	9170	9426	9682	9938	*0193
170	23 0449	0704	0960	1215	1470	1724	1979	2234	2488	2742

170–200

Proportional Parts				Proportional Parts				Proportional Parts				Proportional Parts			
	255	254	253		252	251	250		249	248	247		246	245	244
1	25.5	25.4	25.3	1	25.2	25.1	25.0	1	24.9	24.8	24.7	1	24.6	24.5	24.4
2	51.0	50.8	50.6	2	50.4	50.2	50.0	2	49.8	49.6	49.4	2	49.2	49.0	48.8
3	76.5	76.2	75.9	3	75.6	75.3	75.0	3	74.7	74.4	74.1	3	73.8	73.5	73.2
4	102.0	101.6	101.2	4	100.8	100.4	100.0	4	99.6	99.2	98.8	4	98.4	98.0	97.6
5	127.5	127.0	126.5	5	126.0	125.5	125.0	5	124.5	124.0	123.5	5	123.0	122.5	122.0
6	153.0	152.4	151.8	6	151.2	150.6	150.0	6	149.4	148.8	148.2	6	147.6	147.0	146.4
7	178.5	177.8	177.1	7	176.4	175.7	175.0	7	174.3	173.6	172.9	7	172.2	171.5	170.8
8	204.0	203.2	202.4	8	201.6	200.8	200.0	8	199.2	198.4	197.6	8	196.8	196.0	195.2
9	229.5	228.6	227.7	9	226.8	225.9	225.0	9	224.1	223.2	222.3	9	221.4	220.5	219.6
	243	242	241		240	239	238		237	236	235		234	233	232
1	24.3	24.2	24.1	1	24.0	23.9	23.8	1	23.7	23.6	23.5	1	23.4	23.3	23.2
2	48.6	48.4	48.2	2	48.0	47.8	47.6	2	47.4	47.2	47.0	2	46.8	46.6	46.4
3	72.9	72.6	72.3	3	72.0	71.7	71.4	3	71.1	70.8	70.5	3	70.2	69.9	69.6
4	97.2	96.8	96.4	4	96.0	95.6	95.2	4	94.8	94.4	94.0	4	93.6	93.2	92.8
5	121.5	121.0	120.5	5	120.0	119.5	119.0	5	118.5	118.0	117.5	5	117.0	116.5	116.0
6	145.8	145.2	144.6	6	144.0	143.4	142.8	6	142.2	141.6	141.0	6	140.4	139.8	139.2
7	170.1	169.4	168.7	7	168.0	167.3	166.6	7	165.9	165.2	164.5	7	163.8	163.1	162.4
8	194.4	193.6	192.8	8	192.0	191.2	190.4	8	189.6	188.8	188.0	8	187.2	186.4	185.6
9	218.7	217.8	216.9	9	216.0	215.1	214.2	9	213.3	212.4	211.5	9	210.6	209.7	208.8

LOGARITHMS

N	0	1	2	3	4	5	6	7	8	9
170	23 0449	0704	0960	1215	1470	1724	1979	2234	2488	2742
71	2996	3250	3504	3757	4011	4264	4517	4770	5023	5276
72	5528	5781	6033	6285	6537	6789	7041	7292	7544	7795
73	8046	8297	8548	8799	9049	9299	9550	9800	*0050	*0300
74	24 0549	0799	1048	1297	1546	1795	2044	2293	2541	2790
75	3038	3286	3534	3782	4030	4277	4525	4772	5019	5266
76	5513	5759	6006	6252	6499	6745	6991	7237	7482	7728
77	7973	8219	8464	8709	8954	9198	9443	9687	9932	*0176
78	25 0420	0664	0908	1151	1395	1638	1881	2125	2368	2610
79	2853	3096	3338	3580	3822	4064	4306	4548	4790	5031
180	25 5273	5514	5755	5996	6237	6477	6718	6958	7198	7439
81	7679	7918	8158	8398	8637	8877	9116	9355	9594	9833
82	26 0071	0310	0548	0787	1025	1263	1501	1739	1976	2214
83	2451	2688	2925	3162	3399	3636	3873	4109	4346	4582
84	4818	5054	5290	5525	5761	5996	6232	6467	6702	6937
85	7172	7406	7641	7875	8110	8344	8578	8812	9046	9279
86	9513	9746	9980	*0213	*0446	*0679	*0912	*1144	*1377	*1609
87	27 1842	2074	2306	2538	2770	3001	3233	3464	3696	3927
88	4158	4389	4620	4850	5081	5311	5542	5772	6002	6232
89	6462	6692	6921	7151	7380	7609	7838	8067	8296	8525
190	27 8754	8982	9211	9439	9667	9895	*0123	*0351	*0578	*0806
91	28 1033	1261	1488	1715	1942	2169	2396	2622	2849	3075
92	3301	3527	3753	3979	4205	4431	4656	4882	5107	5332
93	5557	5782	6007	6232	6456	6681	6905	7130	7354	7578
94	7802	8026	8249	8473	8696	8920	9143	9366	9589	9812
95	29 0035	0257	0480	0702	0925	1147	1369	1591	1813	2034
96	2256	2478	2699	2920	3141	3363	3584	3804	4025	4246
97	4466	4687	4907	5127	5347	5567	5787	6007	6226	6446
98	6665	6884	7104	7323	7542	7761	7979	8198	8416	8635
99	8853	9071	9289	9507	9725	9943	*0161	*0378	*0595	*0813
200	30 1030	1247	1464	1681	1898	2114	2331	2547	2764	2980

Proportional Parts			
	231	230	229
1	23.1	23.0	22.9
2	46.2	46.0	45.8
3	69.3	69.0	68.7
4	92.4	92.0	91.6
5	115.5	115.0	114.5
6	138.6	138.0	137.4
7	161.7	161.0	160.3
8	184.8	184.0	183.2
9	207.9	207.0	206.1
	228	227	226
1	22.8	22.7	22.6
2	45.6	45.4	45.2
3	68.4	68.1	67.8
4	91.2	90.8	90.4
5	114.0	113.5	113.0
6	136.8	136.2	135.6
7	159.6	158.9	158.2
8	182.4	181.6	180.8
9	205.2	204.3	203.4
	225	224	223
1	22.5	22.4	22.3
2	45.0	44.8	44.6
3	67.5	67.2	66.9
4	90.0	89.6	89.2
5	112.5	112.0	111.5
6	135.0	134.4	133.8
7	157.5	156.8	156.1
8	180.0	179.2	178.4
9	202.5	201.6	200.7
	222	221	220
1	22.2	22.1	22.0
2	44.4	44.2	44.0
3	66.6	66.3	66.0
4	88.8	88.4	88.0
5	111.0	110.5	110.0
6	133.2	132.6	132.0
7	155.4	154.7	154.0
8	177.6	176.8	176.0
9	199.8	198.9	198.0

200–230

Proportional Parts				Proportional Parts				Proportional Parts				Proportional Parts			
	219	218	217		216	215	214		213	212	211		210	209	208
1	21.9	21.8	21.7	1	21.6	21.5	21.4	1	21.3	21.2	21.1	1	21.0	20.9	20.8
2	43.8	43.6	43.4	2	43.2	43.0	42.8	2	42.6	42.4	42.2	2	42.0	41.8	41.6
3	65.7	65.4	65.1	3	64.8	64.5	64.2	3	63.9	63.6	63.3	3	63.0	62.7	62.4
4	87.6	87.2	86.8	4	86.4	86.0	85.6	4	85.2	84.8	84.4	4	84.0	83.6	83.2
5	109.5	109.0	108.5	5	108.0	107.5	107.0	5	106.5	106.0	105.5	5	105.0	104.5	104.0
6	131.4	130.8	130.2	6	129.6	129.0	128.4	6	127.8	127.2	126.6	6	126.0	125.4	124.8
7	153.3	152.6	151.9	7	151.2	150.5	149.8	7	149.1	148.4	147.7	7	147.0	146.3	145.6
8	175.2	174.4	173.6	8	172.8	172.0	171.2	8	170.4	169.6	168.8	8	168.0	167.2	166.4
9	197.1	196.2	195.3	9	194.4	193.5	192.6	9	191.7	190.8	189.9	9	189.0	188.1	187.2
	207	206	205		204	203	202		201	200	199		198	197	196
1	20.7	20.6	20.5	1	20.4	20.3	20.2	1	20.1	20.0	19.9	1	19.8	19.7	19.6
2	41.4	41.2	41.0	2	40.8	40.6	40.4	2	40.2	40.0	39.8	2	39.6	39.4	39.2
3	62.1	61.8	61.5	3	61.2	60.9	60.6	3	60.3	60.0	59.7	3	59.4	59.1	58.8
4	82.8	82.4	82.0	4	81.6	81.2	80.8	4	80.4	80.0	79.6	4	79.2	78.8	78.4
5	103.5	103.0	102.5	5	102.0	101.5	101.0	5	100.5	100.0	99.5	5	99.0	98.5	98.0
6	124.2	123.6	123.0	6	122.4	121.8	121.2	6	120.6	120.0	119.4	6	118.8	118.2	117.6
7	144.9	144.2	143.5	7	142.8	142.1	141.4	7	140.7	140.0	139.3	7	138.6	137.9	137.2
8	165.6	164.8	164.0	8	163.2	162.4	161.6	8	160.8	160.0	159.2	8	158.4	157.6	156.8
9	186.3	185.4	184.5	9	183.6	182.7	181.8	9	180.9	180.0	179.1	9	178.2	177.3	176.4

Proportional Parts			
	195	194	193
1	19.5	19.4	19.3
2	39.0	38.8	38.6
3	58.5	58.2	57.9
4	78.0	77.6	77.2
5	97.5	97.0	96.5
6	117.0	116.4	115.8
7	136.5	135.8	135.1
8	156.0	155.2	154.4
9	175.5	174.6	173.7
	192	191	190
1	19.2	19.1	19.0
2	38.4	38.2	38.0
3	57.6	57.3	57.0
4	76.8	76.4	76.0
5	96.0	95.5	95.0
6	115.2	114.6	114.0
7	134.4	133.7	133.0
8	153.6	152.8	152.0
9	172.8	171.9	171.0
	189		
1	18.9		
2	37.8		
3	56.7		
4	75.6		
5	94.5		
6	113.4		
7	132.3		
8	151.2		
9	170.1		
	188		
1	18.8		
2	37.6		
3	56.4		
4	75.2		
5	94.0		
6	112.8		
7	131.6		
8	150.4		
9	169.2		

LOGARITHMS

N	0	1	2	3	4	5	6	7	8	9
200	30 1030	1247	1464	1681	1898	2114	2331	2547	2764	2980
01	3196	3412	3628	3844	4059	4275	4491	4706	4921	5136
02	5351	5566	5781	5996	6211	6425	6639	6854	7068	7282
03	7496	7710	7924	8137	8351	8564	8778	8991	9204	9417
04	9630	9843	*0056	*0268	*0481	*0693	*0906	*1118	*1330	*1542
05	31 1754	1966	2177	2389	2600	2812	3023	3234	3445	3656
06	3867	4078	4289	4499	4710	4920	5130	5340	5551	5760
07	5970	6180	6390	6599	6809	7018	7227	7436	7646	7854
08	8063	8272	8481	8689	8898	9106	9314	9522	9730	9938
09	32 0146	0354	0562	0769	0977	1184	1391	1598	1805	2012
210	32 2219	2426	2633	2839	3046	3252	3458	3665	3871	4077
11	4282	4488	4694	4899	5105	5310	5516	5721	5926	6131
12	6336	6541	6745	6950	7155	7359	7563	7767	7972	8176
13	8380	8583	8787	8991	9194	9398	9601	9805	*0008	*0211
14	33 0414	0617	0819	1022	1225	1427	1630	1832	2034	2236
15	2438	2640	2842	3044	3246	3447	3649	3850	4051	4253
16	4454	4655	4856	5057	5257	5458	5658	5859	6059	6260
17	6460	6660	6860	7060	7260	7459	7659	7858	8058	8257
18	8456	8656	8855	9054	9253	9451	9650	9849	*0047	*0246
19	34 0444	0642	0841	1039	1237	1435	1632	1830	2028	2225
220	34 2423	2620	2817	3014	3212	3409	3606	3802	3999	4196
21	4392	4589	4785	4981	5178	5374	5570	5766	5962	6157
22	6353	6549	6744	6939	7135	7330	7525	7720	7915	8110
23	8305	8500	8694	8889	9083	9278	9472	9666	9860	*0054
24	35 0248	0442	0636	0829	1023	1216	1410	1603	1796	1989
25	2183	2375	2568	2761	2954	3147	3339	3532	3724	3916
26	4108	4301	4493	4685	4876	5068	5260	5452	5643	5834
27	6026	6217	6408	6599	6790	6981	7172	7363	7554	7744
28	7935	8125	8316	8506	8696	8886	9076	9266	9456	9646
29	9835	*0025	*0215	*0404	*0593	*0783	*0972	*1161	*1350	*1539
230	36 1728	1917	2105	2294	2482	2671	2859	3048	3236	3424

230–270

Proportional Parts				Proportional Parts				Proportional Parts				Proportional Parts			
	189	188	187		186	185	184		183	182	181		180	179	178
1	18.9	18.8	18.7	1	18.6	18.5	18.4	1	18.3	18.2	18.1	1	18.0	17.9	17.8
2	37.8	37.6	37.4	2	37.2	37.0	36.8	2	36.6	36.4	36.2	2	36.0	35.8	35.6
3	56.7	56.4	56.1	3	55.8	55.5	55.2	3	54.9	54.6	54.3	3	54.0	53.7	53.4
4	75.6	75.2	74.8	4	74.4	74.0	73.6	4	73.2	72.8	72.4	4	72.0	71.6	71.2
5	94.5	94.0	93.5	5	93.0	92.5	92.0	5	91.5	91.0	90.5	5	90.0	89.5	89.0
6	113.4	112.8	112.2	6	111.6	111.0	110.4	6	109.8	109.2	108.6	6	108.0	107.4	106.8
7	132.3	131.6	130.9	7	130.2	129.5	128.8	7	128.1	127.4	126.7	7	126.0	125.3	124.6
8	151.2	150.4	149.6	8	148.8	148.0	147.2	8	146.4	145.6	144.8	8	144.0	143.2	142.4
9	170.1	169.2	168.3	9	167.4	166.5	165.6	9	164.7	163.8	162.9	9	162.0	161.1	160.2

LOGARITHMS

N	0	1	2	3	4	5	6	7	8	9		177	176	175
230	36 1728	1917	2105	2294	2482	2671	2859	3048	3236	3424	1	17.7	17.6	17.5
31	3612	3800	3988	4176	4363	4551	4739	4926	5113	5301	2	35.4	35.2	35.0
32	5488	5675	5862	6049	6236	6423	6610	6796	6983	7169	3	53.1	52.8	52.5
33	7356	7542	7729	7915	8101	8287	8473	8659	8845	9030	4	70.8	70.4	70.0
34	9216	9401	9587	9772	9958	*0143	*0328	*0513	*0698	*0883	5	88.5	88.0	87.5
											6	106.2	105.6	105.0
35	37 1068	1253	1437	1622	1806	1991	2175	2360	2544	2728	7	123.9	123.2	122.5
36	2912	3096	3280	3464	3647	3831	4015	4198	4382	4565	8	141.6	140.8	140.0
37	4748	4932	5115	5298	5481	5664	5846	6029	6212	6394	9	159.3	158.4	157.5
38	6577	6759	6942	7124	7306	7488	7670	7852	8034	8216				
39	8398	8580	8761	8943	9124	9306	9487	9668	9849	*0030		174	173	172
											1	17.4	17.3	17.2
240	38 0211	0392	0573	0754	0934	1115	1296	1476	1656	1837	2	34.8	34.6	34.4
41	2017	2197	2377	2557	2737	2917	3097	3277	3456	3636	3	52.2	51.9	51.6
42	3815	3995	4174	4353	4533	4712	4891	5070	5249	5428	4	69.6	69.2	68.8
43	5606	5785	5964	6142	6321	6499	6677	6856	7034	7212	5	87.0	86.5	86.0
44	7390	7568	7746	7923	8101	8279	8456	8634	8811	8989	6	104.4	103.8	103.2
											7	121.8	121.1	120.4
45	9166	9343	9520	9698	9875	*0051	*0228	*0405	*0582	*0759	8	139.2	138.4	137.6
46	39 0935	1112	1288	1464	1641	1817	1993	2169	2345	2521	9	156.6	155.7	154.8
47	2697	2873	3048	3224	3400	3575	3751	3926	4101	4277				
48	4452	4627	4802	4977	5152	5326	5501	5676	5850	6025		171	170	169
49	6199	6374	6548	6722	6896	7071	7245	7419	7592	7766	1	17.1	17.0	16.9
											2	34.2	34.0	33.8
250	39 7940	8114	8287	8461	8634	8808	8981	9154	9328	9501	3	51.3	51.0	50.7
51	9674	9847	*0020	*0192	*0365	*0538	*0711	*0883	*1056	*1228	4	68.4	68.0	67.6
52	40 1401	1573	1745	1917	2089	2261	2433	2605	2777	2949	5	85.5	85.0	84.5
53	3121	3292	3464	3635	3807	3978	4149	4320	4492	4663	6	102.6	102.0	101.4
54	4834	5005	5176	5346	5517	5688	5858	6029	6199	6370	7	119.7	119.0	118.3
											8	136.8	136.0	135.2
55	6540	6710	6881	7051	7221	7391	7561	7731	7901	8070	9	153.9	153.0	152.1
56	8240	8410	8579	8749	8918	9087	9257	9426	9595	9764				
57	9933	*0102	*0271	*0440	*0609	*0777	*0946	*1114	*1283	*1451		168	167	166
58	41 1620	1788	1956	2124	2293	2461	2629	2796	2964	3132	1	16.8	16.7	16.6
59	3300	3467	3635	3803	3970	4137	4305	4472	4639	4806	2	33.6	33.4	33.2
											3	50.4	50.1	49.8
260	41 4973	5140	5307	5474	5641	5808	5974	6141	6308	6474	4	67.2	66.8	66.4
61	6641	6807	6973	7139	7306	7472	7638	7804	7970	8135	5	84.0	83.5	83.0
62	8301	8467	8633	8798	8964	9129	9295	9460	9625	9791	6	100.8	100.2	99.6
63	9956	*0121	*0286	*0451	*0616	*0781	*0945	*1110	*1275	*1439	7	117.6	116.9	116.2
64	42 1604	1768	1933	2097	2261	2426	2590	2754	2918	3082	8	134.4	133.6	132.8
											9	151.2	150.3	149.4
65	3246	3410	3574	3737	3901	4065	4228	4392	4555	4718		165	164	163
66	4882	5045	5208	5371	5534	5697	5860	6023	6186	6349	1	16.5	16.4	16.3
67	6511	6674	6836	6999	7161	7324	7486	7648	7811	7973	2	33.0	32.8	32.6
68	8135	8297	8459	8621	8783	8944	9106	9268	9429	9591	3	49.5	49.2	48.9
69	9752	9914	*0075	*0236	*0398	*0559	*0720	*0881	*1042	*1203	4	66.0	65.6	65.2
											5	82.5	82.0	81.5
270	43 1364	1525	1685	1846	2007	2167	2328	2488	2649	2809	6	99.0	98.4	97.8
											7	115.5	114.8	114.1
											8	132.0	131.2	130.4
											9	148.5	147.6	146.7

270–310

Proportional Parts				Proportional Parts				Proportional Parts				Proportional Parts			
	162	161	160		159	158	157		156	155	154		153	152	151
1	16.2	16.1	16.0	1	15.9	15.8	15.7	1	15.6	15.5	15.4	1	15.3	15.2	15.1
2	32.4	32.2	32.0	2	31.8	31.6	31.4	2	31.2	31.0	30.8	2	30.6	30.4	30.2
3	48.6	48.3	48.0	3	47.7	47.4	47.1	3	46.8	46.5	46.2	3	45.9	45.6	45.3
4	64.8	64.4	64.0	4	63.6	63.2	62.8	4	62.4	62.0	61.6	4	61.2	60.8	60.4
5	81.0	80.5	80.0	5	79.5	79.0	78.5	5	78.0	77.5	77.0	5	76.5	76.0	75.5
6	97.2	96.6	96.0	6	95.4	94.8	94.2	6	93.6	93.0	92.4	6	91.8	91.2	90.6
7	113.4	112.7	112.0	7	111.3	110.6	109.9	7	109.2	108.5	107.8	7	107.1	106.4	105.7
8	129.6	128.8	128.0	8	127.2	126.4	125.6	8	124.8	124.0	123.2	8	122.4	121.6	120.8
9	145.8	144.9	144.0	9	143.1	142.2	141.3	9	140.4	139.5	138.6	9	137.7	136.8	135.9

	150	149	148
1	15.0	14.9	14.8
2	30.0	29.8	29.6
3	45.0	44.7	44.4
4	60.0	59.6	59.2
5	75.0	74.5	74.0
6	90.0	89.4	88.8
7	105.0	104.3	103.6
8	120.0	119.2	118.4
9	135.0	134.1	133.2

	147	146	145
1	14.7	14.6	14.5
2	29.4	29.2	29.0
3	44.1	43.8	43.5
4	58.8	58.4	58.0
5	73.5	73.0	72.5
6	88.2	87.6	87.0
7	102.9	102.2	101.5
8	117.6	116.8	116.0
9	132.3	131.4	130.5

	144	143
1	14.4	14.3
2	28.8	28.6
3	43.2	42.9
4	57.6	57.2
5	72.0	71.5
6	86.4	85.8
7	100.8	100.1
8	115.2	114.4
9	129.6	128.7

	142	141
1	14.2	14.1
2	28.4	28.2
3	42.6	42.3
4	56.8	56.4
5	71.0	70.5
6	85.2	84.6
7	99.4	98.7
8	113.6	112.8
9	127.8	126.9

	140
1	14.0
2	28.0
3	42.0
4	56.0
5	70.0
6	84.0
7	98.0
8	112.0
9	126.0

LOGARITHMS

N	0	1	2	3	4	5	6	7	8	9
270	43 1364	1525	1685	1846	2007	2167	2328	2488	2649	2809
71	2969	3130	3290	3450	3610	3770	3930	4090	4249	4409
72	4569	4729	4888	5048	5207	5367	5526	5685	5844	6004
73	6163	6322	6481	6640	6799	6957	7116	7275	7433	7592
74	7751	7909	8067	8226	8384	8542	8701	8859	9017	9175
75	9333	9491	9648	9806	9964	*0122	*0279	*0437	*0594	*0752
76	44 0909	1066	1224	1381	1538	1695	1852	2009	2166	2323
77	2480	2637	2793	2950	3106	3263	3419	3576	3732	3889
78	4045	4201	4357	4513	4669	4825	4981	5137	5293	5449
79	5604	5760	5915	6071	6226	6382	6537	6692	6848	7003
280	44 7158	7313	7468	7623	7778	7933	8088	8242	8397	8552
81	8706	8861	9015	9170	9324	9478	9633	9787	9941	*0095
82	45 0249	0403	0557	0711	0865	1018	1172	1326	1479	1633
83	1786	1940	2093	2247	2400	2553	2706	2859	3012	3165
84	3318	3471	3624	3777	3930	4082	4235	4387	4540	4692
85	4845	4997	5150	5302	5454	5606	5758	5910	6062	6214
86	6366	6518	6670	6821	6973	7125	7276	7428	7579	7731
87	7882	8033	8184	8336	8487	8638	8789	8940	9091	9242
88	9392	9543	9694	9845	9995	*0146	*0296	*0447	*0597	*0748
89	46 0898	1048	1198	1348	1499	1649	1799	1948	2098	2248
290	46 2398	2548	2697	2847	2997	3146	3296	3445	3594	3744
91	3893	4042	4191	4340	4490	4639	4788	4936	5085	5234
92	5383	5532	5680	5829	5977	6126	6274	6423	6571	6719
93	6868	7016	7164	7312	7460	7608	7756	7904	8052	8200
94	8347	8495	8643	8790	8938	9085	9233	9380	9527	9675
95	9822	9969	*0116	*0263	*0410	*0557	*0704	*0851	*0998	*1145
96	47 1292	1438	1585	1732	1878	2025	2171	2318	2464	2610
97	2756	2903	3049	3195	3341	3487	3633	3779	3925	4071
98	4216	4362	4508	4653	4799	4944	5090	5235	5381	5526
99	5671	5816	5962	6107	6252	6397	6542	6687	6832	6976
300	47 7121	7266	7411	7555	7700	7844	7989	8133	8278	8422
01	8566	8711	8855	8999	9143	9287	9431	9575	9719	9863
02	48 0007	0151	0294	0438	0582	0725	0869	1012	1156	1299
03	1443	1586	1729	1872	2016	2159	2302	2445	2588	2731
04	2874	3016	3159	3302	3445	3587	3730	3872	4015	4157
05	4300	4442	4585	4727	4869	5011	5153	5295	5437	5579
06	5721	5863	6005	6147	6289	6430	6572	6714	6855	6997
07	7138	7280	7421	7563	7704	7845	7986	8127	8269	8410
08	8551	8692	8833	8974	9114	9255	9396	9537	9677	9818
09	9958	*0099	*0239	*0380	*0520	*0661	*0801	*0941	*1081	*1222
310	49 1362	1502	1642	1782	1922	2062	2201	2341	2481	2621

310–350

Proportional Parts				Proportional Parts			Proportional Parts			Proportional Parts		
	140	139	138	137	136	135	134	133	132	131	130	129
1	14.0	13.9	13.8	13.7	13.6	13.5	13.4	13.3	13.2	13.1	13.0	12.9
2	28.0	27.8	27.6	27.4	27.2	27.0	26.8	26.6	26.4	26.2	26.0	25.8
3	42.0	41.7	41.4	41.1	40.8	40.5	40.2	39.9	39.6	39.3	39.0	38.7
4	56.0	55.6	55.2	54.8	54.4	54.0	53.6	53.2	52.8	52.4	52.0	51.6
5	70.0	69.5	69.0	68.5	68.0	67.5	67.0	66.5	66.0	65.5	65.0	64.5
6	84.0	83.4	82.8	82.2	81.6	81.0	80.4	79.8	79.2	78.6	78.0	77.4
7	98.0	97.3	96.6	95.9	95.2	94.5	93.8	93.1	92.4	91.7	91.0	90.3
8	112.0	111.2	110.4	109.6	108.8	108.0	107.2	106.4	105.6	104.8	104.0	103.2
9	126.0	125.1	124.2	123.3	122.4	121.5	120.6	119.7	118.8	117.9	117.0	116.1

	123	127
1	12.8	12.7
2	25.6	25.4
3	38.4	38.1
4	51.2	50.8
5	64.0	63.5
6	76.8	76.2
7	89.6	88.9
8	102.4	101.6
9	115.2	114.3

	126	125
1	12.6	12.5
2	25.2	25.0
3	37.8	37.5
4	50.4	50.0
5	63.0	62.5
6	75.6	75.0
7	88.2	87.5
8	100.8	100.0
9	113.4	112.5

	124
1	12.4
2	24.8
3	37.2
4	49.6
5	62.0
6	74.4
7	86.8
8	99.2
9	111.6

	123
1	12.3
2	24.6
3	36.9
4	49.2
5	61.5
6	73.8
7	86.1
8	98.4
9	110.7

LOGARITHMS

N	0	1	2	3	4	5	6	7	8	9
310	49 1362	1502	1642	1782	1922	2062	2201	2341	2481	2621
11	2760	2900	3040	3179	3319	3458	3597	3737	3876	4015
12	4155	4294	4433	4572	4711	4850	4989	5128	5267	5406
13	5544	5683	5822	5960	6099	6238	6376	6515	6653	6791
14	6930	7068	7206	7344	7483	7621	7759	7897	8035	8173
15	8311	8448	8586	8724	8862	8999	9137	9275	9412	9550
16	9687	9824	9962	*0099	*0236	*0374	*0511	*0648	*0785	*0922
17	50 1059	1196	1333	1470	1607	1744	1880	2017	2154	2291
18	2427	2564	2700	2837	2973	3109	3246	3382	3518	3655
19	3791	3927	4063	4199	4335	4471	4607	4743	4878	5014
320	50 5150	5286	5421	5557	5693	5828	5964	6099	6234	6370
21	6505	6640	6776	6911	7046	7181	7316	7451	7586	7721
22	7856	7991	8126	8260	8395	8530	8664	8799	8934	9068
23	9203	9337	9471	9606	9740	9874	*0009	*0143	*0277	*0411
24	51 0545	0679	0813	0947	1081	1215	1349	1482	1616	1750
25	1883	2017	2151	2284	2418	2551	2684	2818	2951	3084
26	3218	3351	3484	3617	3750	3883	4016	4149	4282	4415
27	4548	4681	4813	4946	5079	5211	5344	5476	5609	5741
28	5874	6006	6139	6271	6403	6535	6668	6800	6932	7064
29	7196	7328	7460	7592	7724	7855	7987	8119	8251	8382
330	51 8514	8646	8777	8909	9040	9171	9303	9434	9566	9697
31	9828	9959	*0090	*0221	*0353	*0484	*0615	*0745	*0876	*1007
32	52 1138	1269	1400	1530	1661	1792	1922	2053	2183	2314
33	2444	2575	2705	2835	2966	3096	3226	3356	3486	3616
34	3746	3876	4006	4136	4266	4396	4526	4656	4785	4915
35	5045	5174	5304	5434	5563	5693	5822	5951	6081	6210
36	6339	6469	6598	6727	6856	6985	7114	7243	7372	7501
37	7630	7759	7888	8016	8145	8274	8402	8531	8660	8788
38	8917	9045	9174	9302	9430	9559	9687	9815	9943	*0072
39	53 0200	0328	0456	0584	0712	0840	0968	1096	1223	1351
340	53 1479	1607	1734	1862	1990	2117	2245	2372	2500	2627
41	2754	2882	3009	3136	3264	3391	3518	3645	3772	3899
42	4026	4153	4280	4407	4534	4661	4787	4914	5041	5167
43	5294	5421	5547	5674	5800	5927	6053	6180	6306	6432
44	6558	6685	6811	6937	7063	7189	7315	7441	7567	7693
45	7819	7945	8071	8197	8322	8448	8574	8699	8825	8951
46	9076	9202	9327	9452	9578	9703	9829	9954	*0079	*0204
47	54 0329	0455	0580	0705	0830	0955	1080	1205	1330	1454
48	1579	1704	1829	1953	2078	2203	2327	2452	2576	2701
49	2825	2950	3074	3199	3323	3447	3571	3696	3820	3944
350	54 4068	4192	4316	4440	4564	4688	4812	4937	5060	5183

350–400

LOGARITHMS											PROPORTIONAL PARTS		
N	0	1	2	3	4	5	6	7	8	9		124	123	122
350	54 4068	4192	4316	4440	4564	4688	4812	4936	5060	5183	1	12.4	12.3	12.2
51	5307	5431	5555	5678	5802	5925	6049	6172	6296	6419	2	24.8	24.6	24.4
52	6543	6666	6789	6913	7036	7159	7282	7405	7529	7652	3	37.2	36.9	36.6
53	7775	7898	8021	8144	8267	8389	8512	8635	8758	8881	4	49.6	49.2	48.8
54	9003	9126	9249	9371	9494	9616	9739	9861	9984	*0106	5	62.0	61.5	61.0
											6	74.4	73.8	73.2
55	55 0228	0351	0473	0595	0717	0840	0962	1084	1206	1328	7	86.8	86.1	85.4
56	1450	1572	1694	1816	1938	2060	2181	2303	2425	2547	8	99.2	98.4	97.6
57	2668	2790	2911	3033	3155	3276	3398	3519	3640	3762	9	111.6	110.7	109.8
58	3883	4004	4126	4247	4368	4489	4610	4731	4852	4973		121	120	119
59	5094	5215	5336	5457	5578	5699	5820	5940	6061	6182				
											1	12.1	12.0	11.9
360	55 6303	6423	6544	6664	6785	6905	7026	7146	7267	7387	2	24.2	24.0	23.8
61	7507	7627	7748	7868	7988	8108	8228	8349	8469	8589	3	36.3	36.0	35.7
62	8709	8829	8949	9068	9188	9308	9428	9548	9667	9787	4	48.4	48.0	47.6
63	9907	*0026	*0146	*0265	*0385	*0504	*0624	*0743	*0863	*0982	5	60.5	60.0	59.5
64	56 1101	1221	1340	1459	1578	1698	1817	1936	2055	2174	6	72.6	72.0	71.4
											7	84.7	84.0	83.3
65	2293	2412	2531	2650	2769	2887	3006	3125	3244	3362	8	96.8	96.0	95.2
66	3481	3600	3718	3837	3955	4074	4192	4311	4429	4548	9	108.9	108.0	107.1
67	4666	4784	4903	5021	5139	5257	5376	5494	5612	5730		118	117	116
68	5848	5966	6084	6202	6320	6437	6555	6673	6791	6909				
69	7026	7144	7262	7379	7497	7614	7732	7849	7967	8084	1	11.8	11.7	11.6
											2	23.6	23.4	23.2
370	56 8202	8319	8436	8554	8671	8788	8905	9023	9140	9257	3	35.4	35.1	34.8
71	9374	9491	9608	9725	9842	9959	*0076	*0193	*0309	*0426	4	47.2	46.8	46.4
72	57 0543	0660	0776	0893	1010	1126	1243	1359	1476	1592	5	59.0	58.5	58.0
73	1709	1825	1942	2058	2174	2291	2407	2523	2639	2755	6	70.8	70.2	69.6
74	2872	2988	3104	3220	3336	3452	3568	3684	3800	3915	7	82.6	81.9	81.2
											8	94.4	93.6	92.8
75	4031	4147	4263	4379	4494	4610	4726	4841	4957	5072	9	106.2	105.3	104.4
76	5188	5303	5419	5534	5650	5765	5880	5996	6111	6226		115	114	113
77	6341	6457	6572	6687	6802	6917	7032	7147	7262	7377				
78	7492	7607	7722	7836	7951	8066	8181	8295	8410	8525	1	11.5	11.4	11.3
79	8639	8754	8868	8983	9097	9212	9326	9441	9555	9669	2	23.0	22.8	22.6
											3	34.5	34.2	33.9
380	57 9784	9898	*0012	*0126	*0241	*0355	*0469	*0583	*0697	*0811	4	46.0	45.6	45.2
81	58 0925	1039	1153	1267	1381	1495	1608	1722	1836	1950	5	57.5	57.0	56.5
82	2063	2177	2291	2404	2518	2631	2745	2858	2972	3085	6	69.0	68.4	67.8
83	3199	3312	3426	3539	3652	3765	3879	3992	4105	4218	7	80.5	79.8	79.1
84	4331	4444	4557	4670	4783	4896	5009	5122	5235	5348	8	92.0	91.2	90.4
											9	103.5	102.6	101.7
85	5461	5574	5686	5799	5912	6024	6137	6250	6362	6475		112	111	110
86	6587	6700	6812	6925	7037	7149	7262	7374	7486	7599				
87	7711	7823	7935	8047	8160	8272	8384	8496	8608	8720	1	11.2	11.1	11.0
88	8832	8944	9056	9167	9279	9391	9503	9615	9726	9838	2	22.4	22.2	22.0
89	9950	*0061	*0173	*0284	*0396	*0507	*0619	*0730	*0842	*0953	3	33.6	33.3	33.0
											4	44.8	44.4	44.0
390	59 1065	1176	1287	1399	1510	1621	1732	1843	1955	2066	5	56.0	55.5	55.0
91	2177	2288	2399	2510	2621	2732	2843	2954	3064	3175	6	67.2	66.6	66.0
92	3286	3397	3508	3618	3729	3840	3950	4061	4171	4282	7	78.4	77.7	77.0
93	4393	4503	4614	4724	4834	4945	5055	5165	5276	5386	8	89.6	88.8	88.0
94	5496	5606	5717	5827	5937	6047	6157	6267	6377	6487	9	100.8	99.9	99.0
												109	108	
95	6597	6707	6817	6927	7037	7146	7256	7366	7476	7586	1	10.9	10.8	
96	7695	7805	7914	8024	8134	8243	8353	8462	8572	8681	2	21.8	21.6	
97	8791	8900	9009	9119	9228	9337	9446	9556	9665	9774	3	32.7	32.4	
98	9883	9992	*0101	*0210	*0319	*0428	*0537	*0646	*0755	*0864	4	43.6	43.2	
99	60 0973	1082	1191	1299	1408	1517	1625	1734	1843	1951	5	54.5	54.0	
											6	65.4	64.8	
400	60 2060	2169	2277	2386	2494	2603	2711	2819	2928	3036	7	76.3	75.6	
											8	87.2	86.4	
											9	98.1	97.2	

400–450

N	0	1	2	3	4	5	6	7	8	9
400	60 2060	2169	2277	2386	2494	2603	2711	2819	2928	3036
01	3144	3253	3361	3469	3577	3686	3794	3902	4010	4118
02	4226	4334	4442	4550	4658	4766	4874	4982	5089	5197
03	5305	5413	5521	5628	5736	5844	5951	6059	6166	6274
04	6381	6489	6596	6704	6811	6919	7026	7133	7241	7348
05	7455	7562	7669	7777	7884	7991	8098	8205	8312	8419
06	8526	8633	8740	8847	8954	9061	9167	9274	9381	9488
07	9594	9701	9808	9914	*0021	*0128	*0234	*0341	*0447	*0554
08	61 0660	0767	0873	0979	1086	1192	1298	1405	1511	1617
09	1723	1829	1936	2042	2148	2254	2360	2466	2572	2678
410	61 2784	2890	2996	3102	3207	3313	3419	3525	3630	3736
11	3842	3947	4053	4159	4264	4370	4475	4581	4686	4792
12	4897	5003	5108	5213	5319	5424	5529	5634	5740	5845
13	5950	6055	6160	6265	6370	6476	6581	6686	6790	6895
14	7000	7105	7210	7315	7420	7525	7629	7734	7839	7943
15	8048	8153	8257	8362	8466	8571	8676	8780	8884	8989
16	9093	9198	9302	9406	9511	9615	9719	9824	9928	*0032
17	62 0136	0240	0344	0448	0552	0656	0760	0864	0968	1072
18	1176	1280	1384	1488	1592	1695	1799	1903	2007	2110
19	2214	2318	2421	2525	2628	2732	2835	2939	3042	3146
420	62 3249	3353	3456	3559	3663	3766	3869	3973	4076	4179
21	4282	4385	4488	4591	4695	4798	4901	5004	5107	5210
22	5312	5415	5518	5621	5724	5827	5929	6032	6135	6238
23	6340	6443	6546	6648	6751	6853	6956	7058	7161	7263
24	7366	7468	7571	7673	7775	7878	7980	8082	8185	8287
25	8389	8491	8593	8695	8797	8900	9002	9104	9206	9308
26	9410	9512	9613	9715	9817	9919	*0021	*0123	*0224	*0326
27	63 0428	0530	0631	0733	0835	0936	1038	1139	1241	1342
28	1444	1545	1647	1748	1849	1951	2052	2153	2255	2356
29	2457	2559	2660	2761	2862	2963	3064	3165	3266	3367
430	63 3468	3569	3670	3771	3872	3973	4074	4175	4276	4376
31	4477	4578	4679	4779	4880	4981	5081	5182	5283	5383
32	5484	5584	5685	5785	5886	5986	6087	6187	6287	6388
33	6488	6588	6688	6789	6889	6989	7089	7189	7290	7390
34	7490	7590	7690	7790	7890	7990	8090	8190	8290	8389
35	8489	8589	8689	8789	8888	8988	9088	9188	9287	9387
36	9486	9586	9686	9785	9885	9984	*0084	*0183	*0283	*0382
37	64 0481	0581	0680	0779	0879	0978	1077	1177	1276	1375
38	1474	1573	1672	1771	1871	1970	2069	2168	2267	2366
39	2465	2563	2662	2761	2860	2959	3058	3156	3255	3354
440	64 3453	3551	3650	3749	3847	3946	4044	4143	4242	4340
41	4439	4537	4636	4734	4832	4931	5029	5127	5226	5324
42	5422	5521	5619	5717	5815	5913	6011	6110	6208	6306
43	6404	6502	6600	6698	6796	6894	6992	7089	7187	7285
44	7383	7481	7579	7676	7774	7872	7969	8067	8165	8262
45	8360	8458	8555	8653	8750	8848	8945	9043	9140	9237
46	9335	9432	9530	9627	9724	9821	9919	*0016	*0113	*0210
47	65 0308	0405	0502	0599	0696	0793	0890	0987	1084	1181
48	1278	1375	1472	1569	1666	1762	1859	1956	2053	2150
49	2246	2343	2440	2536	2633	2730	2826	2923	3019	3116
450	653213	3309	3405	3502	3598	3695	3791	3888	3984	4080

Proportional Parts

	109	108	107
1	10.9	10.8	10.7
2	21.8	21.6	21.4
3	32.7	32.4	32.1
4	43.6	43.2	42.8
5	54.5	54.0	53.5
6	65.4	64.8	64.2
7	76.3	75.6	74.9
8	87.2	86.4	85.6
9	98.1	97.2	96.3

	106	105	104
1	10.6	10.5	10.4
2	21.2	21.0	20.8
3	31.8	31.5	31.2
4	42.4	42.0	41.6
5	53.0	52.5	52.0
6	63.6	63.0	62.4
7	74.2	73.5	72.8
8	84.8	84.0	83.2
9	95.4	94.5	93.6

	103	102	101
1	10.3	10.2	10.1
2	20.6	20.4	20.2
3	30.9	30.6	30.3
4	41.2	40.8	40.4
5	51.5	51.0	50.5
6	61.8	61.2	60.6
7	72.1	71.4	70.7
8	82.4	81.6	80.8
9	92.7	91.8	90.9

	100	99
1	10.0	9.9
2	20.0	19.8
3	30.0	29.7
4	40.0	39.6
5	50.0	49.5
6	60.0	59.4
7	70.0	69.3
8	80.0	79.2
9	90.0	89.1

	98
1	9.8
2	19.6
3	29.4
4	39.2
5	49.0
6	58.8
7	68.6
8	78.4
9	88.2

	97
1	9.7
2	19.4
3	29.1
4	38.8
5	48.5
6	58.2
7	67.9
8	77.6
9	87.3

450–500

LOGARITHMS											PROPORTIONAL PARTS			
N	0	1	2	3	4	5	6	7	8	9		96	95	94
450	65 3213	3309	3405	3502	3598	3695	3791	3888	3984	4080	1	9.6	9.5	9.4
51	4177	4273	4369	4465	4562	4658	4754	4850	4946	5042	2	19.2	19.0	18.8
52	5138	5235	5331	5427	5523	5619	5715	5810	5906	6002	3	28.8	28.5	28.2
53	6098	6194	6290	6386	6482	6577	6673	6769	6864	6960	4	38.4	38.0	37.6
54	7056	7152	7247	7343	7438	7534	7629	7725	7820	7916	5	48.0	47.5	47.0
											6	57.6	57.0	56.4
55	8011	8107	8202	8298	8393	8488	8584	8679	8774	8870	7	67.2	66.5	65.8
56	8965	9060	9155	9250	9346	9441	9536	9631	9726	9821	8	76.8	76.0	75.2
57	9916	*0011	*0106	*0201	*0296	*0391	*0486	*0581	*0676	*0771	9	86.4	85.5	84.6
58	66 0865	0960	1055	1150	1245	1339	1434	1529	1623	1718		93		92
59	1813	1907	2002	2096	2191	2286	2380	2475	2569	2663				
											1	9.3		9.2
460	66 2758	2852	2947	3041	3135	3230	3324	3418	3512	3607	2	18.6		18.4
61	3701	3795	3889	3983	4078	4172	4266	4360	4454	4548	3	27.9		27.6
62	4642	4736	4830	4924	5018	5112	5206	5299	5393	5487	4	37.2		36.8
63	5581	5675	5769	5862	5956	6050	6143	6237	6331	6424	5	46.5		46.0
64	6518	6612	6705	6799	6892	6986	7079	7173	7266	7360	6	55.8		55.2
											7	65.1		64.4
65	7453	7546	7640	7733	7826	7920	8013	8106	8199	8293	8	74.4		73.6
66	8386	8479	8572	8665	8759	8852	8945	9038	9131	9224	9	83.7		82.8
67	9317	9410	9503	9596	9689	9782	9875	9967	*0060	*0153		91		90
68	67 0246	0339	0431	0524	0617	0710	0802	0895	0988	1080				
69	1173	1265	1358	1451	1543	1636	1728	1821	1913	2005	1	9.1		9.0
											2	18.2		18.0
470	67 2098	2190	2283	2375	2467	2560	2652	2744	2836	2929	3	27.3		27.0
71	3021	3113	3205	3297	3390	3482	3574	3666	3758	3850	4	36.4		36.0
72	3942	4034	4126	4218	4310	4402	4494	4586	4677	4769	5	45.5		45.0
73	4861	4953	5045	5137	5228	5320	5412	5503	5595	5687	6	54.6		54.0
74	5778	5870	5962	6053	6145	6236	6328	6419	6511	6602	7	63.7		63.0
											8	72.8		72.0
75	6694	6785	6876	6968	7059	7151	7242	7333	7424	7516	9	81.9		81.0
76	7607	7698	7789	7881	7972	8063	8154	8245	8336	8427		89		
77	8518	8609	8700	8791	8882	8973	9064	9155	9246	9337	1	8.9		
78	9428	9519	9610	9700	9791	9882	9973	*0063	*0154	*0245	2	17.8		
79	68 0336	0426	0517	0607	0698	0789	0879	0970	1060	1151	3	26.7		
											4	35.6		
480	68 1241	1332	1422	1513	1603	1693	1784	1874	1964	2055	5	44.5		
81	2145	2235	2326	2416	2506	2596	2686	2777	2867	2957	6	53.4		
82	3047	3137	3227	3317	3407	3497	3587	3677	3767	3857	7	62.3		
83	3947	4037	4127	4217	4307	4396	4486	4576	4666	4756	8	71.2		
84	4845	4935	5025	5114	5204	5294	5383	5473	5563	5652	9	80.1		
												88		
85	5742	5831	5921	6010	6100	6189	6279	6368	6458	6547				
86	6636	6726	6815	6904	6994	7083	7172	7261	7351	7440	1	8.8		
87	7529	7618	7707	7796	7886	7975	8064	8153	8242	8331	2	17.6		
88	8420	8509	8598	8687	8776	8865	8953	9042	9131	9220	3	26.4		
89	9309	9398	9486	9575	9664	9753	9841	9930	*0019	*0107	4	35.2		
											5	44.0		
490	69 0196	0285	0373	0462	0550	0639	0728	0816	0905	0993	6	52.8		
91	1081	1170	1258	1347	1435	1524	1612	1700	1789	1877	7	61.6		
92	1965	2053	2142	2230	2318	2406	2494	2583	2671	2759	8	70.4		
93	2847	2935	3023	3111	3199	3287	3375	3463	3551	3639	9	79.2		
94	3727	3815	3903	3991	4078	4166	4254	4342	4430	4517		87		
											1	8.7		
95	4605	4693	4781	4868	4956	5044	5131	5219	5307	5394	2	17.4		
96	5482	5569	5657	5744	5832	5919	6007	6094	6182	6269	3	26.1		
97	6356	6444	6531	6618	6706	6793	6880	6968	7055	7142	4	34.8		
98	7229	7317	7404	7491	7578	7665	7752	7839	7926	8014	5	43.5		
99	8101	8188	8275	8362	8449	8535	8622	8709	8796	8883	6	52.2		
											7	60.9		
500	69 8970	9057	9144	9231	9317	9404	9491	9578	9664	9751	8	69.6		
											9	78.3		

500–550

N	0	1	2	3	4	5	6	7	8	9
500	69 8970	9057	9144	9231	9317	9404	9491	9578	9664	9751
01	9838	9924	*0011	*0098	*0184	*0271	*0358	*0444	*0531	*0617
02	70 0704	0790	0877	0963	1050	1136	1222	1309	1395	1482
03	1568	1654	1741	1827	1913	1999	2086	2172	2258	2344
04	2431	2517	2603	2689	2775	2861	2947	3033	3119	3205
05	3291	3377	3463	3549	3635	3721	3807	3893	3979	4065
06	4151	4236	4322	4408	4494	4579	4665	4751	4837	4922
07	5008	5094	5179	5265	5350	5436	5522	5607	5693	5778
08	5864	5949	6035	6120	6206	6291	6376	6462	6547	6632
09	6718	6803	6888	6974	7059	7144	7229	7315	7400	7485
510	70 7570	7655	7740	7826	7911	7996	8081	8166	8251	8336
11	8421	8506	8591	8676	8761	8846	8931	9015	9100	9185
12	9270	9355	9440	9524	9609	9694	9779	9863	9948	*0033
13	71 0117	0202	0287	0371	0456	0540	0625	0710	0794	0879
14	0963	1048	1132	1217	130	1385	1470	1554	1639	1723
15	1807	1892	1976	2060	2144	2229	2313	2397	2481	2566
16	2650	2734	2818	2902	2986	3070	3154	3238	3323	3407
17	3491	3575	3659	3742	3826	3910	3994	4078	4162	4246
18	4330	4414	4497	4581	4665	4749	4833	4916	5000	5084
19	5167	5251	5335	5418	5502	5586	5669	5753	5836	5920
520	71 6003	6087	6170	6254	6337	6421	6504	6588	6671	6754
21	6838	6921	7004	7088	7171	7254	7338	7421	7504	7587
22	7671	7754	7837	7920	8003	8086	8169	8253	8336	8419
23	8502	8585	8668	8751	8834	8917	9000	9083	9165	9248
24	9331	9414	9497	9580	9663	9745	9828	9911	9994	*0077
25	72 0159	0242	0325	0407	0490	0573	0655	0738	0821	0903
26	0986	1068	1151	1233	1316	1398	1481	1563	1646	1728
27	1811	1893	1975	2058	2140	2222	2305	2387	2469	2552
28	2634	2716	2798	2881	2963	3045	3127	3209	3291	3374
29	3456	3538	3620	3702	3784	3866	3948	4030	4112	4194
530	72 4276	4358	4440	4522	4604	4685	4767	4849	4931	5013
31	5095	5176	5258	5340	5422	5503	5585	5667	5748	5830
32	5912	5993	6075	6156	6238	6320	6401	6483	6564	6646
33	6727	6809	6890	6972	7053	7134	7216	7297	7379	7460
34	7541	7623	7704	7785	7866	7948	8029	8110	8191	8273
35	8354	8435	8516	8597	8678	8759	8841	8922	9003	9084
36	9165	9246	9327	9408	9489	9570	9651	9732	9813	9893
37	9974	*0055	*0136	*0217	*0298	*0378	*0459	*0540	*0621	*0702
38	73 0782	0863	0944	1024	1105	1186	1266	1347	1428	1508
39	1589	1669	1750	1830	1911	1991	2072	2152	2233	2313
540	73 2394	2474	2555	2635	2715	2796	2876	2956	3037	3117
41	3197	3278	3358	3438	3518	3598	3679	3759	3839	3919
42	3999	4079	4160	4240	4320	4400	4480	4560	4640	4720
43	4800	4880	4960	5040	5120	5200	5279	5359	5439	5519
44	5599	5679	5759	5838	5918	5998	6078	6157	6237	6317
45	6397	6476	6556	6635	6715	6795	6874	6954	7034	7113
46	7193	7272	7352	7431	7511	7590	7670	7749	7829	7908
47	7987	8067	8146	8225	8305	8384	8463	8543	8622	8701
48	8781	8860	8939	9018	9097	9177	9256	9335	9414	9493
49	9572	9651	9731	9810	9889	9968	*0047	*0126	*0205	*0284
550	74 0363	0442	0521	0600	0678	0757	0836	0915	0994	1073

Proportional Parts			
	87	86	85
1	8.7	8.6	8.5
2	17.4	17.2	17.0
3	26.1	25.8	25.5
4	34.8	34.4	34.0
5	43.5	43.0	42.5
6	52.2	51.6	51.0
7	60.9	60.2	59.5
8	69.6	68.8	68.0
9	78.3	77.4	76.5

	84	83
1	8.4	8.3
2	16.8	16.6
3	25.2	24.9
4	33.6	33.2
5	42.0	41.5
6	50.4	49.8
7	58.8	58.1
8	67.2	66.4
9	75.6	74.7

	82
1	8.2
2	16.4
3	24.6
4	32.8
5	41.0
6	49.2
7	57.4
8	65.6
9	73.8

	81
1	8.1
2	16.2
3	24.3
4	32.4
5	40.5
6	48.6
7	56.7
8	64.8
9	72.9

	80
1	8.0
2	16.0
3	24.0
4	32.0
5	40.0
6	48.0
7	56.0
8	64.0
9	72.0

	79
1	7.9
2	15.8
3	23.7
4	31.6
5	39.5
6	47.4
7	55.3
8	63.2
9	71.1

550–600

LOGARITHMS											PROPORTIONAL PARTS	
N	0	1	2	3	4	5	6	7	8	9	79	78
550	74 0363	0442	0521	0600	0678	0757	0836	0915	0994	1073	1 7.9	7.8
51	1152	1230	1309	1388	1467	1546	1624	1703	1782	1860	2 15.8	15.6
52	1939	2018	2096	2175	2254	2332	2411	2489	2568	2647	3 23.7	23.4
53	2725	2804	2882	2961	3039	3118	3196	3275	3353	3431	4 31.6	31.2
54	3510	3588	3667	3745	3823	3902	3980	4058	4136	4215	5 39.5	39.0
											6 47.4	46.8
55	4293	4371	4449	4528	4606	4684	4762	4840	4919	4997	7 55.3	54.6
56	5075	5153	5231	5309	5387	5465	5543	5621	5699	5777	8 63.2	62.4
57	5855	5933	6011	6089	6167	6245	6323	6401	6479	6556	9 71.1	70.2
58	6634	6712	6790	6868	6945	7023	7101	7179	7256	7334		
59	7412	7489	7567	7645	7722	7800	7878	7955	8033	8110		77 / 76
											1 7.7	7.6
560	74 8188	8266	8343	8421	8498	8576	8653	8731	8808	8885	2 15.4	15.2
61	8963	9040	9118	9195	9272	9350	9427	9504	9582	9659	3 23.1	22.8
62	9736	9814	9891	9968	*0045	*0123	*0200	*0277	*0354	*0431	4 30.8	30.4
63	75 0508	0586	0663	0740	0817	0894	0971	1048	1125	1202	5 38.5	38.0
64	1279	1356	1433	1510	1587	1664	1741	1818	1895	1972	6 46.2	45.6
											7 53.9	53.2
65	2048	2125	2202	2279	2356	2433	2509	2586	2663	2740	8 61.6	60.8
66	2816	2893	2970	3047	3123	3200	3277	3353	3430	3506	9 69.3	68.4
67	3583	3660	3736	3813	3889	3966	4042	4119	4195	4272		75
68	4348	4425	4501	4578	4654	4730	4807	4883	4960	5036		
69	5112	5189	5265	5341	5417	5494	5570	5646	5722	5799	1 7.5	
											2 15.0	
570	75 5875	5951	6027	6103	6180	6256	6332	6408	6484	6560	3 22.5	
71	6636	6712	6788	6864	6940	7016	7092	7168	7244	7320	4 30.0	
72	7396	7472	7548	7624	7700	7775	7851	7927	8003	8079	5 37.5	
73	8155	8230	8306	8382	8458	8533	8609	8685	8761	8836	6 45.0	
74	8912	8988	9063	9139	9214	9290	9366	9441	9517	9592	7 52.5	
											8 60.0	
75	9668	9743	9819	9894	9970	*0045	*0121	*0196	*0272	*0347	9 67.5	
76	76 0422	0498	0573	0649	0724	0799	0875	0950	1025	1101		74
77	1176	1251	1326	1402	1477	1552	1627	1702	1778	1853	1 7.4	
78	1928	2003	2078	2153	2228	2303	2378	2453	2529	2604	2 14.8	
79	2679	2754	2829	2904	2978	3053	3128	3203	3278	3353	3 22.2	
											4 29.6	
580	76 3428	3503	3578	3653	3727	3802	3877	3952	4027	4101	5 37.0	
81	4176	4251	4326	4400	4475	4550	4624	4699	4774	4848	6 44.4	
82	4923	4998	5072	5147	5221	5296	5370	5445	5520	5594	7 51.8	
83	5669	5743	5818	5892	5966	6041	6115	6190	6264	6338	8 59.2	
84	6413	6487	6562	6636	6710	6785	6859	6933	7007	7082	9 66.6	
												73
85	7156	7230	7304	7379	7453	7527	7601	7675	7749	7823		
86	7898	7972	8046	8120	8194	8268	8342	8416	8490	8564	1 7.3	
87	8638	8712	8786	8860	8934	9008	9082	9156	9230	9303	2 14.6	
88	9377	9451	9525	9599	9673	9746	9820	9894	9968	*0042	3 21.9	
89	77 0115	0189	0263	0336	0410	0484	0557	0631	0705	0778	4 29.2	
											5 36.5	
590	77 0852	0926	0999	1073	1146	1220	1293	1367	1440	1514	6 43.8	
91	1587	1661	1734	1808	1881	1955	2028	2102	2175	2248	7 51.1	
92	2322	2395	2468	2542	2615	2688	2762	2835	2908	2981	8 58.4	
93	3055	3128	3201	3274	3348	3421	3494	3567	3640	3713	9 65.7	
94	3786	3860	3933	4006	4079	4152	4225	4298	4371	4444		72
											1 7.2	
95	4517	4590	4663	4736	4809	4882	4955	5028	5100	5173	2 14.4	
96	5246	5319	5392	5465	5538	5610	5683	5756	5829	5902	3 21.6	
97	5974	6047	6120	6193	6265	6338	6411	6483	6556	6629	4 28.8	
98	6701	6774	6846	6919	6992	7064	7137	7209	7282	7354	5 36.0	
99	7427	7499	7572	7644	7717	7789	7862	7934	8006	8079	6 43.2	
											7 50.4	
600	77 8151	8224	8296	8368	8441	8513	8585	8658	8730	8802	8 57.6	
											9 64.8	

600–650

N	0	1	2	3	4	5	6	7	8	9
600	77 8151	8224	8296	8368	8441	8513	8585	8658	8730	8802
01	8874	8947	9019	9091	9163	9236	9308	9380	9452	9524
02	9596	9669	9741	9813	9885	9957	*0029	*0101	*0173	*0245
03	78 0317	0389	0461	0533	0605	0677	0749	0821	0893	0965
04	1037	1109	1181	1253	1324	1396	1468	1540	1612	1684
05	1755	1827	1899	1971	2042	2114	2186	2258	2329	2401
06	2473	2544	2616	2688	2759	2831	2902	2974	3046	3117
07	3189	3260	3332	3403	3475	3546	3618	3689	3761	3832
08	3904	3975	4046	4118	4189	4261	4332	4403	4475	4546
09	4617	4689	4760	4831	4902	4974	5045	5116	5187	5259
610	78 5330	5401	5472	5543	5615	5686	5757	5828	5899	5970
11	6041	6112	6183	6254	6325	6396	6467	6538	6609	6680
12	6751	6822	6893	6964	7035	7106	7177	7248	7319	7390
13	7460	7531	7602	7673	7744	7815	7885	7956	8027	8098
14	8168	8239	8310	8381	8451	8522	8593	8663	8734	8804
15	8875	8946	9016	9087	9157	9228	9299	9369	9440	9510
16	9581	9651	9722	9792	9863	9933	*0004	*0074	*0144	*0215
17	79 0285	0356	0426	0496	0567	0637	0707	0778	0848	0918
18	0988	1059	1129	1199	1269	1340	1410	1480	1550	1620
19	1691	1761	1831	1901	1971	2041	2111	2181	2252	2322
620	79 2392	2462	2532	2602	2672	2742	2812	2882	2952	3022
21	3092	3162	3231	3301	3371	3441	3511	3581	3651	3721
22	3790	3860	3930	4000	4070	4139	4209	4279	4349	4418
23	4488	4558	4627	4697	4767	4836	4906	4976	5045	5115
24	5185	5254	5324	5393	5463	5532	5602	5672	5741	5811
25	5880	5949	6019	6088	6158	6227	6297	6366	6436	6505
26	6574	6644	6713	6782	6852	6921	6990	7060	7129	7198
27	7268	7337	7406	7475	7545	7614	7683	7752	7821	7890
28	7960	8029	8098	8167	8236	8305	8374	8443	8513	8582
29	8651	8720	8789	8858	8927	8996	9065	9134	9203	9272
630	79 9341	9409	9478	9547	9616	9685	9754	9823	9892	9961
31	80 0029	0098	0167	0236	0305	0373	0442	0511	0580	0648
32	0717	0786	0854	0923	0992	1061	1129	1198	1266	1335
33	1404	1472	1541	1609	1678	1747	1815	1884	1952	2021
34	2089	2158	2226	2295	2363	2432	2500	2568	2637	2705
35	2774	2842	2910	2979	3047	3116	3184	3252	3321	3389
36	3457	3525	3594	3662	3730	3798	3867	3935	4003	4071
37	4139	4208	4276	4344	4412	4480	4548	4616	4685	4753
38	4821	4889	4957	5025	5093	5161	5229	5297	5365	5433
39	5501	5569	5637	5705	5773	5841	5908	5976	6044	6112
640	80 6180	6248	6316	6384	6451	6519	6587	6655	6723	6790
41	6858	6926	6994	7061	7129	7197	7264	7332	7400	7467
42	7535	7603	7670	7738	7806	7873	7941	8008	8076	8143
43	8211	8279	8346	8414	8481	8549	8616	8684	8751	8818
44	8886	8953	9021	9088	9156	9223	9290	9358	9425	9492
45	9560	9627	9694	9762	9829	9896	9964	*0031	*0098	*0165
46	81 0233	0300	0367	0434	0501	0569	0636	0703	0770	0837
47	0904	0971	1039	1106	1173	1240	1307	1374	1441	1508
48	1575	1642	1709	1776	1843	1910	1977	2044	2111	2178
49	2245	2312	2379	2445	2512	2579	2646	2713	2780	2847
650	81 2913	2980	3047	3114	3181	3247	3314	3381	3448	3514

PROPORTIONAL PARTS

	73	72
1	7.3	7.2
2	14.6	14.4
3	21.9	21.6
4	29.2	28.8
5	36.5	36.0
6	43.8	43.2
7	51.1	50.4
8	58.4	57.6
9	65.7	64.8

	71	70
1	7.1	7.0
2	14.2	14.0
3	21.3	21.0
4	28.4	28.0
5	35.5	35.0
6	42.6	42.0
7	49.7	49.0
8	56.8	56.0
9	63.9	63.0

	69
1	6.9
2	13.8
3	20.7
4	27.6
5	34.5
6	41.4
7	48.3
8	55.2
9	62.1

	68
1	6.8
2	13.6
3	20.4
4	27.2
5	34.0
6	40.8
7	47.6
8	54.4
9	61.2

	67
1	6.7
2	13.4
3	20.1
4	26.8
5	33.5
6	40.2
7	46.9
8	53.6
9	60.3

	66
1	6.6
2	13.2
3	19.8
4	26.4
5	33.0
6	39.6
7	46.2
8	52.8
9	59.4

650–700

LOGARITHMS											PROPORTIONAL PARTS
N	0	1	2	3	4	5	6	7	8	9	67
650	81 2913	2980	3047	3114	3181	3247	3314	3381	3448	3514	1 6.7
51	3581	3648	3714	3781	3848	3914	3981	4048	4114	4181	2 13.4
52	4248	4314	4381	4447	4514	4581	4647	4714	4780	4847	3 20.1
53	4913	4980	5046	5113	5179	5246	5312	5378	5445	5511	4 26.8
54	5578	5644	5711	5777	5843	5910	5976	6042	6109	6175	5 33.5
											6 40.2
55	6241	6308	6374	6440	6506	6573	6639	6705	6771	6838	7 46.9
56	6904	6970	7036	7102	7169	7235	7301	7367	7433	7499	8 53.6
57	7565	7631	7698	7764	7830	7896	7962	8028	8094	8160	9 60.3
58	8226	8292	8358	8424	8490	8556	8622	8688	8754	8820	66
59	8885	8951	9017	9083	9149	9215	9281	9346	9412	9478	
											1 6.6
660	81 9544	9610	9676	9741	9807	9873	9939	*0004	*0070	*0136	2 13.2
61	82 0201	0267	0333	0399	0464	0530	0595	0661	0727	0792	3 19.8
62	0858	0924	0989	1055	1120	1186	1251	1317	1382	1448	4 26.4
63	1514	1579	1645	1710	1775	1841	1906	1972	1037	2103	5 33.0
64	2168	2233	2299	2364	2430	2495	2560	2626	2691	2756	6 39.6
											7 46.2
65	2822	2887	2952	3018	3083	3148	3213	3279	3344	3409	8 52.8
66	3474	3539	3605	3670	3735	3800	3865	3930	3996	4061	9 59.4
67	4126	4191	4256	4321	4386	4451	4516	4581	4646	4711	65
68	4776	4841	4906	4971	5036	5101	5166	5231	5296	5361	
69	5426	5491	5556	5621	5686	5751	5815	5880	5945	6010	1 6.5
											2 13.0
670	82 6075	6140	6204	6269	6334	6399	6464	6528	6593	6658	3 19.5
71	6723	6787	6852	6917	6981	7046	7111	7175	7240	7305	4 26.0
72	7369	7434	7499	7563	7628	7692	7757	7821	7886	7951	5 32.5
73	8015	8080	8144	8209	8273	8338	8402	8467	8531	8595	6 39.0
74	8660	8724	8789	8853	8918	8982	9046	9111	9175	9239	7 45.5
											8 52.0
75	9304	9368	9432	9497	9561	9625	9690	9754	9818	9882	9 58.5
76	9947	*0011	*0075	*0139	*0204	*0268	*0332	*0396	*0460	*0525	64
77	83 0589	0653	0717	0781	0845	0909	0973	1037	1102	1166	
78	1230	1294	1358	1422	1486	1550	1614	1678	1742	1806	1 6.4
79	1870	1934	1998	2062	2126	2189	2253	2317	2381	2445	2 12.8
											3 19.2
680	83 2509	2573	2637	2700	2764	2828	2892	2956	3020	3083	4 25.6
81	3147	3211	3275	3338	3402	3466	3530	3593	3657	3721	5 32.0
82	3784	3848	3912	3975	4039	4103	4166	4230	4294	4357	6 38.4
83	4421	4484	4548	4611	4675	4739	4802	4866	4929	4993	7 44.8
84	5056	5120	5183	5247	5310	5373	5437	5500	5564	5627	8 51.2
											9 57.6
85	5691	5754	5817	5881	5944	6007	6071	6134	6197	6261	63
86	6324	6387	6451	6514	6577	6641	6704	6767	6830	6894	
87	6957	7020	7083	7146	7210	7273	7336	7399	7462	7525	1 6.3
88	7588	7652	7715	7778	7841	7904	7967	8030	8093	8156	2 12.6
89	8219	8282	8345	8408	8471	8534	8597	8660	8723	8786	3 18.9
											4 25.2
690	83 8849	8912	8975	9038	9101	9164	9227	9289	9352	9415	5 31.5
91	9478	9541	9604	9667	9729	9792	9855	9918	9981	*0043	6 37.8
92	84 0106	0169	0232	0294	0357	0420	0482	0545	0608	0671	7 44.1
93	0733	0796	0859	0921	0984	1046	1109	1172	1234	1297	8 50.4
94	1359	1422	1485	1547	1610	1672	1735	1797	1860	1922	9 56.7
											62
95	1985	2047	2110	2172	2235	2297	2360	2422	2484	2547	
96	2609	2672	2734	2796	2859	2921	2983	3046	3108	3170	1 6.2
97	3233	3295	3357	3420	3482	3544	3606	3669	3731	3793	2 12.4
98	3855	3918	3980	4042	4104	4166	4229	4291	4353	4415	3 18.6
99	4477	4539	4601	4664	4726	4788	4850	4912	4974	5036	4 24.8
											5 31.0
700	84 5098	5160	5222	5284	5346	5408	5470	5532	5594	5656	6 37.2
											7 43.4
											8 49.6
											9 55.8

700–750

LOGARITHMS											PROPORTIONAL PARTS	
N	0	1	2	3	4	5	6	7	8	9		62
700	84 5098	5160	5222	5284	5346	5408	5470	5532	5594	5656	1	6.2
01	5718	5780	5842	5904	5966	6028	6090	6151	6213	6275	2	12.4
02	6337	6399	6461	6523	6585	6646	6708	6770	6832	6894	3	16.8
03	6955	7017	7079	7141	7202	7264	7326	7388	7449	7511	4	24.8
04	7573	7634	7696	7758	7819	7881	7943	8004	8066	8128	5	31.0
											6	37.2
05	8189	8251	8312	8374	8435	8497	8559	8620	8682	8743	7	43.4
06	8805	8866	8928	8989	9051	9112	9174	9235	9297	9358	8	49.6
07	9419	9481	9542	9604	9665	9726	9788	9849	9911	9972	9	55.8
08	85 0033	0095	0156	0217	0279	0340	0401	0462	0524	0585		
09	0646	0707	0769	0830	0891	0952	1014	1075	1136	1197		61
											1	6.1
710	85 1258	1320	1381	1442	1503	1564	1625	1686	1747	1809	2	12.2
11	1870	1931	1992	2053	2114	2175	2236	2297	2358	2419	3	18.3
12	2480	2541	2602	2663	2724	2785	2846	2907	2968	3029	4	24.4
13	3090	3150	3211	3272	3333	3394	3455	3516	3577	3637	5	30.5
14	3698	3759	3820	3881	3941	4002	4063	4124	4185	4245	6	36.6
											7	42.7
15	4306	4367	4428	4488	4549	4610	4670	4731	4792	4852	8	48.8
16	4913	4974	5034	5095	5156	5216	5277	5337	5398	5459	9	54.9
17	5519	5580	5640	5701	5761	5822	5882	5943	6003	6064		
18	6124	6185	6245	6306	6366	6427	6487	6548	6608	6668		60
19	6729	6789	6850	6910	6970	7031	7091	7152	7212	7272	1	6.0
											2	12.0
720	85 7332	7393	7453	7513	7574	7634	7694	7755	7815	7875	3	18.0
21	7935	7995	8056	8116	8176	8236	8297	8357	8417	8477	4	24.0
22	8537	8597	8657	8718	8778	8838	8898	8958	9018	9078	5	30.0
23	9138	9198	9258	9318	9379	9439	9499	9559	9619	9679	6	36.0
24	9739	9799	9859	9918	9978	*0038	*0098	*0158	*0218	*0278	7	42.0
											8	48.0
25	86 0338	0398	0458	0518	0578	0637	0697	0757	0817	0877	9	54.0
26	0937	0996	1056	1116	1176	1236	1295	1355	1415	1475		
27	1534	1594	1654	1714	1773	1833	1893	1952	2012	2072		59
28	2131	2191	2251	2310	2370	2430	2489	2549	2608	2668	1	5.9
29	2728	2787	2847	2906	2966	3025	3085	3144	3204	3263	2	11.8
											3	17.7
730	86 3323	3382	3442	3501	3561	3620	3680	3739	3799	3858	4	23.6
31	3917	3977	4036	4096	4155	4214	4274	4333	4392	4452	5	29.5
32	4511	4570	4630	4689	4748	4808	4867	4926	4985	5045	6	35.4
33	5104	5163	5222	5282	5341	5400	5459	5519	5578	5637	7	41.3
34	5696	5755	5814	5874	5933	5992	6051	6110	6169	6228	8	47.2
											9	53.1
35	6287	6346	6405	6465	6524	6583	6642	6701	6760	6819		58
36	6878	6937	6996	7055	7114	7173	7232	7291	7350	7409	1	5.8
37	7467	7526	7585	7644	7703	7762	7821	7880	7939	7998	2	11.6
38	8056	8115	8174	8233	8292	8350	8409	8468	8527	8586	3	17.4
39	8644	8703	8762	8821	8879	8938	8997	9056	9114	9173	4	23.2
											5	29.0
740	86 9232	9290	9349	9408	9466	9525	9584	9642	9701	9760	6	34.8
41	9818	9877	9935	9994	*0053	*0111	*0170	*0228	*0287	*0345	7	40.6
42	87 0404	0462	0521	0579	0638	0696	0755	0813	0872	0930	8	46.4
43	0989	1047	1106	1164	1223	1281	1339	1398	1456	1515	9	52.2
44	1573	1631	1690	1748	1806	1865	1923	1981	2040	2098		
												57
45	2156	2215	2273	2331	2389	2448	2506	2564	2622	2681	1	5.7
46	2739	2797	2855	2913	2972	3030	3088	3146	3204	3262	2	11.4
47	3321	3379	3437	3495	3553	3611	3669	3727	3785	3844	3	17.1
48	3902	3960	4018	4076	4134	4192	4250	4308	4366	4424	4	22.8
49	4482	4540	4598	4656	4714	4772	4830	4888	4945	5003	5	28.5
											6	34.2
750	87 5061	5119	5177	5235	5293	5351	5409	5466	5524	5582	7	39.9
											8	45.6
											9	51.3

750–800

N	0	1	2	3	4	5	6	7	8	9
750	87 5061	5119	5177	5235	5293	5351	5409	5466	5524	5582
51	5640	5698	5756	5813	5871	5929	5987	6045	6102	6160
52	6218	6276	6333	6391	6449	6507	6564	6622	6680	6737
53	6795	6853	6910	6968	7026	7083	7141	7199	7256	7314
54	7371	7429	7487	7544	7602	7659	7717	7774	7832	7889
55	7947	8004	8062	8119	8177	8234	8292	8349	8407	8464
56	8522	8579	8637	8694	8752	8809	8866	8924	8981	9039
57	9096	9153	9211	9268	9325	9383	9440	9497	9555	9612
58	9669	9726	9784	9841	9898	9956	*0013	*0070	*0127	*0185
59	88 0242	0299	0356	0413	0471	0528	0585	0642	0699	0756
760	88 0814	0871	0928	0985	1042	1099	1156	1213	1271	1328
61	1385	1442	1499	1556	1613	1670	1727	1784	1841	1898
62	1955	2012	2069	2126	2183	2240	2297	2354	2411	2468
63	2525	2581	2638	2695	2752	2809	2866	2923	2980	3037
64	3093	3150	3207	3264	3321	3377	3434	3491	3548	3605
65	3661	3718	3775	3832	3888	3945	4002	4059	4115	4172
66	4229	4285	4342	4399	4455	4512	4569	4625	4682	4739
67	4795	4852	4909	4965	5022	5078	5135	5192	5248	5305
68	5361	5418	5474	5531	5587	5644	5700	5757	5813	5870
69	5926	5983	6039	6096	6152	6209	6265	6321	6378	6434
770	88 6491	6547	6604	6660	6716	6773	6829	6885	6942	6998
71	7054	7111	7167	7223	7280	7336	7392	7449	7505	7561
72	7617	7674	7730	7786	7842	7898	7955	8011	8067	8123
73	8179	8236	8292	8348	8404	8460	8516	8573	8629	8685
74	8741	8797	8853	8909	8965	9021	9077	9134	9190	9246
75	9302	9358	9414	9470	9526	9582	9638	9694	9750	9806
76	9862	9918	9974	*0030	*0086	*0141	*0197	*0253	*0309	*0365
77	89 0421	0477	0533	0589	0645	0700	0756	0812	0868	0924
78	0980	1035	1091	1147	1203	1259	1314	1370	1426	1482
79	1537	1593	1649	1705	1760	1816	1872	1928	1983	2039
780	89 2095	2150	2206	2262	2317	2373	2429	2484	2540	2595
81	2651	2707	2762	2818	2873	2929	2985	3040	3096	3151
82	3207	3262	3318	3373	3429	3484	3540	3595	3651	3706
83	3762	3817	3873	3928	3984	4039	4094	4150	4205	4261
84	4316	4371	4427	4482	4538	4593	4648	4704	4759	4814
85	4870	4925	4980	5036	5091	5146	5201	5257	5312	5367
86	5423	5478	5533	5588	5644	5699	5754	5809	5864	5920
87	5975	6030	6085	6140	6195	6251	6306	6361	6416	6471
88	6526	6581	6636	6692	6747	6802	6857	6912	6967	7022
89	7077	7132	7187	7242	7297	7352	7407	7462	7517	7572
790	89 7627	7682	7737	7792	7847	7902	7957	8012	8067	8122
91	8176	8231	8286	8341	8396	8451	8506	8561	8615	8670
92	8725	8780	8835	8890	8944	8999	9054	9109	9164	9218
93	9273	9328	9383	9437	9492	9547	9602	9656	9711	9766
94	9821	9875	9930	9985	*0039	*0094	*0149	*0203	*0258	*0312
95	90 0367	0422	0476	0531	0586	0640	0695	0749	0804	0859
96	0913	0968	1022	1077	1131	1186	1240	1295	1349	1404
97	1458	1513	1567	1622	1676	1731	1785	1840	1894	1948
98	2003	2057	2112	2166	2221	2275	2329	2384	2438	2492
99	2547	2601	2655	2710	2764	2818	2873	2927	2981	3036
800	90 3090	3144	3199	3253	3307	3361	3416	3470	3524	3578

PROPORTIONAL PARTS

	58
1	5.8
2	11.6
3	17.4
4	23.2
5	29.0
6	34.8
7	40.6
8	46.4
9	52.2

	57
1	5.7
2	11.4
3	17.1
4	22.8
5	28.5
6	34.2
7	39.9
8	45.6
9	51·3

	56
1	5.6
2	11.2
3	16.8
4	22.4
5	28.0
6	33.6
7	39.2
8	44.8
9	50.4

	55
1	5.5
2	11.0
3	16.5
4	22.0
5	27.5
6	33.0
7	38.5
8	44.0
9	49.5

800–850

N	0	1	2	3	4	5	6	7	8	9
800	90 3090	3144	3199	3253	3307	3361	3416	3470	3524	3578
01	3633	3687	3741	3795	3849	3904	3958	4012	4066	4120
02	4174	4229	4283	4337	4391	4445	4499	4553	4607	4661
03	4716	4770	4824	4878	4932	4986	5040	5094	5148	5202
04	5256	5310	5364	5418	5472	5526	5580	5634	5688	5742
05	5796	5850	5904	5958	6012	6066	6119	6173	6227	6281
06	6335	6389	6443	6497	6551	6604	6658	6712	6766	6820
07	6874	6927	6981	7035	7089	7143	7196	7250	7304	7358
08	7411	7465	7519	7573	7626	7680	7734	7787	7841	7895
09	7949	8002	8056	8110	8163	8217	8270	8324	8378	8431
810	90 8485	8539	8592	8646	8699	8753	8807	8860	8914	8967
11	9021	9074	9128	9181	9235	9289	9342	9396	9449	9503
12	9556	9610	9663	9716	9770	9823	9877	9930	9984	*0037
13	91 0091	0144	0197	0251	0304	0358	0411	0464	0518	0571
14	0624	0678	0731	0784	0838	0891	0944	0998	1051	1104
15	1158	1211	1264	1317	1371	1424	1477	1530	1584	1637
16	1690	1743	1797	1850	1903	1956	2009	2063	2116	2169
17	2222	2275	2328	2381	2435	2488	2541	2594	2647	2700
18	2753	2806	2839	2913	2966	3019	3072	3125	3178	3231
19	3284	3337	3390	3443	3496	3549	3602	3655	3708	3761
820	91 3814	3867	3920	3973	4026	4079	4132	4184	4237	4290
21	4343	4396	4449	4502	4555	4608	4660	4713	4766	4819
22	4872	4925	4977	5030	5083	5136	5189	5241	5294	5347
23	5400	5453	5505	5558	5611	5664	5716	5769	5822	5875
24	5927	5980	6033	6085	6138	6191	6243	6296	6349	6401
25	6454	6507	6559	6612	6664	6717	6770	6822	6875	6927
26	6980	7033	7085	7138	7190	7243	7295	7348	7400	7453
27	7506	7558	7611	7663	7716	7768	7820	7873	7925	7978
28	8030	8083	8135	8188	8240	8293	8345	8397	8450	8502
29	8555	8607	8659	8712	8764	8816	8869	8921	8973	9026
830	91 9078	9130	9183	9235	9287	9340	9392	9444	9496	9549
31	9601	9653	9706	9758	9810	9862	9914	9967	*0019	*0071
32	92 0123	0176	0228	0280	0332	0384	0436	0489	0541	0593
33	0645	0697	0749	0801	0853	0906	0958	1010	1062	1114
34	1166	1218	1270	1322	1374	1426	1478	1530	1582	1634
35	1686	1738	1790	1842	1894	1946	1998	2050	2102	2154
36	2206	2258	2310	2362	2414	2466	2518	2570	2622	2674
37	2725	2777	2829	2881	2933	2985	3037	3089	3140	3192
38	3244	3296	3348	3399	3451	3503	3555	3607	3658	3710
39	3762	3814	3865	3917	3969	4021	4072	4124	4176	4228
840	92 4279	4331	4383	4434	4486	4538	4589	4641	4693	4744
41	4796	4848	4899	4951	5003	5054	5106	5157	5209	5261
42	5312	5364	5415	5467	5518	5570	5621	5673	5725	5776
43	5828	5879	5931	5982	6034	6085	6137	6188	6240	6291
44	6342	6394	6445	6497	6548	6600	6651	6702	6754	6805
45	6857	6908	6959	7011	7062	7114	7165	7216	7268	7319
46	7370	7422	7473	7524	7576	7627	7678	7730	7781	7832
47	7883	7935	7986	8037	8088	8140	8191	8242	8293	8345
48	8396	8447	8498	8549	8601	8652	8703	8754	8805	8857
49	8909	8959	9010	9061	9112	9163	9215	9266	9317	9368
850	92 9419	9470	9521	9572	9623	9674	9725	9776	9827	9879

Proportional Parts

54

1	5.4
2	10.8
3	16.2
4	21.6
5	27.0
6	32.4
7	37.8
8	43.2
9	48.6

53

1	5.3
2	10.6
3	15.9
4	21.2
5	26.5
6	31.8
7	37.1
8	42.4
9	47.7

52

1	5.2
2	10.4
3	15.6
4	20.8
5	26.0
6	31.2
7	36.4
8	41.6
9	46.8

51

1	5.1
2	10.2
3	15.3
4	20.4
5	25.5
6	30.6
7	35.7
8	40.8
9	45.9

850–900

LOGARITHMS											PROPORTIONAL PARTS	
N	0	1	2	3	4	5	6	7	8	9		51
850	92 9419	9470	9521	9572	9623	9674	9725	9776	9827	9879	1	5.1
51	9930	9981	*0032	*0083	*0134	*0185	*0236	*0287	*0338	*0389	2	10.2
52	93 0440	0491	0542	0592	0643	0694	0745	0796	0847	0898	3	15.3
53	0949	1000	1051	1102	1153	1204	1254	1305	1356	1407	4	20.4
54	1458	1509	1560	1610	1661	1712	1763	1814	1865	1915	5	25.5
											6	30.6
55	1966	2017	2068	2118	2169	2220	2271	2322	2372	2423	7	35.7
56	2474	2524	2575	2626	2677	2727	2778	2829	2879	2930	8	40.8
57	2981	3031	3082	3133	3183	3234	3285	3335	3386	3437	9	45.9
58	3487	3538	3589	3639	3690	3740	3791	3841	3892	3943		
59	3993	4044	4094	4145	4195	4246	4296	4347	4397	4448		50
860	93 4498	4549	4599	4650	4700	4751	4801	4852	4902	4953		
61	5003	5054	5104	5154	5205	5255	5306	5356	5406	5457		
62	5507	5558	5608	5658	5709	5759	5809	5860	5910	5960	1	5.0
63	6011	6061	6111	6162	6212	6262	6313	6363	6413	6463	2	10.0
64	6514	6564	6614	6665	6715	6765	6815	6865	6916	6966	3	15.0
											4	20.0
65	7016	7066	7117	7167	7217	7267	7317	7367	7418	7468	5	25.0
66	7518	7568	7618	7668	7718	7769	7819	7869	7919	7969	6	30.0
67	8019	8069	8119	8169	8219	8269	8320	8370	8420	8470	7	35.9
68	8520	8570	8620	8670	8720	8770	8820	8870	8920	8970	8	40.0
69	9020	9070	9120	9170	9220	9270	9320	9369	9419	9469	9	45.0
870	93 9519	9569	9619	9669	9719	9769	9819	9869	9918	9968		
71	94 0018	0068	0118	0168	0218	0267	0317	0367	0417	0467		49
72	0516	0566	0616	0666	0716	0765	0815	0865	0915	0964		
73	1014	1064	1114	1163	1213	1263	1313	1362	1412	1462		
74	1511	1561	1611	1660	1710	1760	1809	1859	1909	1958	1	4.9
											2	9.8
75	2008	2058	2107	2157	2207	2256	2306	2355	2405	2455	3	14.7
76	2504	2554	2603	2653	2702	2752	2801	2851	2901	2950	4	19.6
77	3000	3049	3099	3148	3198	3247	3297	3346	3396	3445	5	24.5
78	3495	3544	3593	3643	3692	3742	3791	3841	3890	3939	6	29.4
79	3989	4038	4088	4137	4186	4236	4285	4335	4384	4433	7	34.3
											8	39.2
880	94 4483	4532	4581	4631	4680	4729	4779	4828	4877	4927	9	44.1
81	4976	5025	5074	5124	5173	5222	5272	5321	5370	5419		
82	5469	5518	5567	5616	5665	5715	5764	5813	5862	5912		
83	5961	6010	6059	6108	6157	6207	6256	6305	6354	6403		48
84	6452	6501	6551	6600	6649	6698	6747	6796	6845	6894		
85	6943	6992	7041	7090	7140	7189	7238	7287	7336	7385		
86	7434	7483	7532	7581	7630	7679	7728	7777	7826	7875	1	4.8
87	7924	7973	8022	8070	8119	8168	8217	8266	8315	8364	2	9.6
88	8413	8462	8511	8560	8609	8657	8706	8755	8804	8853	3	14.4
89	8902	8951	8999	9048	9097	9146	9195	9244	9292	9341	4	19.2
											5	24.0
890	94 9390	9439	9488	9536	9585	9634	9683	9731	9780	9829	6	28.8
91	9878	9926	9975	*0024	*0073	*0121	*0170	*0219	*0267	*0316	7	33.6
92	95 0365	0414	0462	0511	0560	0608	0657	0706	0754	0803	8	38.4
93	0851	0900	0949	0997	1046	1095	1143	1192	1240	1289	9	43.2
94	1338	1386	1435	1483	1532	1580	1629	1677	1726	1775		
95	1823	1872	1920	1969	2017	2066	2114	2163	2211	2260		
96	2308	2356	2405	2453	2502	2550	2599	2647	2696	2744		
97	2792	2841	2889	2938	2986	3034	3083	3131	3180	3228		
98	3276	3325	3373	3421	3470	3518	3566	3615	3663	3711		
99	3760	3808	3856	3905	3953	4001	4049	4098	4146	4194		
900	95 4243	4291	4339	4387	4435	4484	4532	4580	4628	4677		

900–950

N	LOGARITHMS										Proportional Parts
	0	1	2	3	4	5	6	7	8	9	48
900	95 4243	4291	4339	4387	4435	4484	4532	4580	4628	4677	1 4.8
01	4725	4773	4821	4869	4918	4966	5014	5062	5110	5158	2 9.6
02	5207	5255	5303	5351	5399	5447	5495	5543	5592	5640	3 14.4
03	5688	5736	5784	5832	5880	5928	5976	6024	6072	6120	4 19.2
54	6168	6216	6265	6313	6361	6409	6457	6505	6553	6601	5 24.0
											6 28.8
05	6649	6697	6745	6793	6840	6888	6936	6984	7032	7080	7 33.6
06	7128	7176	7224	7272	7320	7368	7416	7464	7512	7559	8 38.4
07	7607	7655	7703	7751	7799	7847	7894	7942	7990	8038	9 43.2
08	8086	8134	8181	8229	8277	8325	8373	8421	8468	8516	
09	8564	8612	8659	8707	8755	8803	8850	8898	8946	8994	
											47
910	95 9041	9089	9137	9185	9232	9280	9328	9375	9423	9471	
11	9518	9566	9614	9661	9709	9757	9804	9852	9900	9947	
12	9995	*0042	*0090	*0138	*0185	*0233	*0280	*0328	*0376	*0423	1 4.7
13	96 0471	0518	0566	0613	0661	0709	0756	0804	0851	0899	2 9.4
14	0946	0994	1041	1089	1136	1184	1231	1279	1326	1374	3 14.1
											4 18.8
15	1421	1469	1516	1563	1611	1658	1706	1753	1801	1848	5 23.5
16	1895	1943	1990	2038	2085	2132	2180	2227	2275	2322	6 28.2
17	2369	2417	2464	2511	2559	2606	2653	2701	2748	2795	7 32.9
18	2843	2890	2937	2985	3032	3079	3126	3174	3221	3268	8 37.6
19	3316	3363	3410	3457	3504	3552	3599	3646	3693	3741	9 42.3
920	96 3788	3835	3882	3929	3977	4024	4071	4118	4165	4212	
21	4260	4307	4354	4401	4448	4495	4542	4590	4637	4684	
22	4731	4778	4825	4872	4919	4966	5013	5061	5108	5155	46
23	5202	5249	5296	5343	5390	5437	5484	5531	5578	5625	
24	5672	5719	5766	5813	5860	5907	5954	6001	6048	6095	
											1 4.6
25	6142	6189	6236	6283	6329	6376	6423	6470	6517	6564	2 9.2
26	6611	6658	6705	6752	6799	6845	6892	6939	6986	7033	3 13.8
27	7080	7127	7173	7220	7267	7314	7361	7408	7454	7501	4 18.4
28	7548	7595	7642	7688	7735	7782	7829	7875	7922	7969	5 23.0
29	8016	8062	8109	8156	8203	8249	8296	8343	8390	8436	6 27.6
											7 32.2
930	96 8483	8530	8576	8623	8670	8716	8763	8810	8856	8903	8 36.8
31	8950	8996	9043	9090	9136	9183	9229	9276	9323	9369	9 41.4
32	9416	9463	9509	9556	9602	9649	9695	9742	9789	9835	
33	9882	9928	9975	*0021	*0068	*0114	*0161	*0207	*0254	*0300	
34	97 0347	0393	0440	0486	0533	0579	0626	0672	0719	0765	
35	0812	0858	0904	0951	0997	1044	1090	1137	1183	1229	
36	1276	1322	1369	1415	1461	1508	1554	1601	1647	1693	
37	1740	1786	1832	1879	1925	1971	2018	2064	2110	2157	
38	2203	2249	2295	2342	2388	2434	2481	2527	2573	2619	
39	2666	2712	2758	2804	2851	2897	2943	2989	3035	3082	
940	97 3128	3174	3220	3266	3313	3359	3405	3451	3497	3543	
41	3590	3636	3682	3728	3774	3820	3866	3913	3959	4005	
42	4051	4097	4143	4189	4235	4281	4327	4374	4420	4466	
43	4512	4558	4604	4650	4696	4742	4788	4834	4880	4926	
44	4972	5018	5064	5110	5156	5202	5248	5294	5340	5386	
45	5432	5478	5524	5570	5616	5662	5707	5753	5799	5845	
46	5891	5937	5983	6029	6075	6121	6167	6212	6258	6304	
47	6350	6396	6442	6488	6533	6579	6625	6671	6717	6763	
48	6808	6854	6900	6946	6992	7037	7083	7129	7175	7220	
49	7266	7312	7358	7403	7449	7495	7541	7586	7632	7678	
950	97 7724	7769	7815	7861	7906	7952	7998	8043	8089	8135	

950–1000

LOGARITHMS											PROPORTIONAL PARTS	
N	0	1	2	3	4	5	6	7	8	9		45
950	97 7724	7769	7815	7861	7906	7952	7998	8043	8089	8135	1	4.5
51	8181	8226	8272	8317	8363	8409	8454	8500	8546	8591	2	9.0
52	8637	8683	8728	8774	8819	8865	8911	8956	9002	9047	3	13.5
53	9093	9138	9184	9230	9275	9321	9366	9412	9457	9503	4	18.0
54	9548	9594	9639	9685	9730	9776	9821	9867	9912	9958	5	22.5
											6	27.0
55	98 0003	0049	0094	0140	0185	0231	0276	0322	0367	0412	8	31.5
56	0458	0503	0549	0594	0640	0685	0730	0776	0821	0867	8	36.0
57	0912	0957	1003	1048	1093	1139	1184	1229	1275	1320	9	40.5
58	1366	1411	1456	1501	1547	1592	1637	1683	1728	1773		
59	1819	1864	1909	1954	2000	2045	2090	2135	2181	2226		
												44
960	98 2271	2316	2362	2407	2452	2497	2543	2588	2633	2678		
61	2723	2769	2814	2859	2904	2949	2994	3040	3085	3130		
62	3175	3220	3265	3310	3356	3401	3446	3491	3536	3581	1	4.4
63	3626	3671	3716	3762	3807	3852	3897	3942	3987	4032	2	8.8
64	4077	4122	4167	4212	4257	4302	4347	4392	4437	4482	3	13.2
											4	17.6
65	4527	4572	4617	4662	4707	4752	4797	4842	4887	4932	5	22.0
66	4977	5022	5067	5112	5157	5202	5247	5292	5337	5382	6	26.4
67	5426	5471	5516	5561	5606	5651	5696	5741	5786	5830	7	30.8
68	5875	5920	5965	6010	6055	6100	6144	6189	6234	6279	8	35.2
69	6324	6369	6413	6458	6503	6548	6593	6637	6682	6727	9	39.9
970	98 6772	6817	6861	6906	6951	6996	7040	7085	7130	7175		
71	7219	7264	7309	7353	7398	7443	7488	7532	7577	7622		43
72	7666	7711	7756	7800	7845	7890	7934	7979	8024	8068		
73	8113	8157	8202	8247	8291	8336	8381	8425	8470	8514		
74	8559	8604	8648	8693	8737	8782	8826	8871	8916	8960		
											1	4.3
75	9005	9049	9094	9138	9183	9227	9272	9316	9361	9405	2	8.6
76	9450	9494	9539	9583	9628	9672	9717	9761	9806	9850	3	12.9
77	9895	9939	9983	*0028	*0072	*0117	*0161	*0206	*0250	*0294	4	17.2
78	99 0339	0383	0428	0472	0516	0561	0605	0650	0694	0738	5	21.5
79	0783	0827	0871	0916	0960	1004	1049	1093	1137	1182	6	25.8
											7	30.1
980	99 1226	1270	1315	1359	1403	1448	1492	1336	1580	1625	8	34.4
81	1669	1713	1758	1802	1846	1890	1935	1979	2023	2067	9	38.7
82	2111	2156	2200	2244	2288	2333	2377	2421	2465	2509		
83	2554	2598	2642	2686	2730	2774	2819	2863	2907	2951		
84	2995	3039	3083	3127	3172	3216	3260	3304	3348	3392		
85	3436	3480	3524	3568	3613	3657	3701	3745	3789	3833		
86	3877	3921	3965	4009	4053	4097	4141	4185	4229	4273		
87	4317	4361	4405	4449	4493	4537	4581	4625	4669	4713		
88	4757	4801	4845	4889	4933	4977	5021	5065	5108	5152		
89	5196	5240	5284	5328	5372	5416	5460	5504	5547	5591		
990	99 5635	5679	5723	5767	5811	5854	5898	5942	5986	6030		
91	6074	6117	6161	6205	6249	6293	6337	6380	6424	6468		
92	6512	6555	6599	6643	6687	6731	6774	6818	6862	6906		
93	6949	6993	7037	7080	7124	7168	7212	7255	7299	7343		
94	7386	7430	7474	7517	7561	7605	7648	7692	7736	7779		
95	7823	7867	7910	7954	7998	8041	8085	8129	8172	8216		
96	8259	8303	8347	8390	8434	8477	8521	8564	8608	8652		
97	8695	8739	8782	8826	8869	8913	8956	9000	9043	9087		
98	9131	9174	9218	9261	9305	9348	9392	9435	9479	9522		
99	9565	9609	9652	9696	9739	9783	9826	9870	9913	9957		
1000												

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